

PB-230 534

POLLUTION OF THE INTERSTATE WATERS OF
THE GRAND CALUMET RIVER, LITTLE CALUMET
RIVER, CALUMET RIVER, WOLF LAKE, LAKE
MICHIGAN AND THEIR TRIBUTARIES. PROCEED-
INGS OF CONFERENCE (TECHNICAL SESSION),
HELD AT CHICAGO, ILLINOIS ON
JANUARY 4-5, 1966. VOLUME 1.

Federal Water Pollution Control Administration
Washington, D.C.

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VOLUME 1



Conference

**In the matter of Pollution of
the Interstate Waters of the
Grand Calumet River, Little
Calumet River, Calumet River,
Wolf Lake, Lake Michigan
and their Tributaries**

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**TECHNICAL SESSION
JANUARY 4-5, 1966**

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

C O N T E N T S

	<u>Page</u>
Murray Stein	4, 574
H. W. Poston	15, 571
Grover Cook	21, 158
Francis Kittrell	107
Commander Charles E. Waite	163
B. A. Poole	172
Perry Miller	175
Mayor A. Martin Katz	209
Mayor John B. Nicosia	219, 249
Cornell A. Leahu	224
A. G. Giannini	305
Clark N. Johnson	317
Herbert J. Dunsmore	321, 506
Joseph Baum	342
George A. Blaine	351
E. D. Keiper, Jr.	362
James E. Kirkpatrick	386
Ross Harbaugh	408
Bruce Burns	422
Russell Mallatt	433
George H. McIntosh	449
Clarence W. Klassen	463
Colonel F. W. Chesrow	480

C O N T E N T S (Continued)

	<u>Page</u>
Louis F. Birkel	515
J. H. Miller	525
Harry Henderson	543
Charles Murphy	560

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> The report on the Conference on the Pollution of the Interstate
Waters of the Grand Calumet River, Little Calumet River,
Calumet River, Wolf Lake, Lake Michigan and their Tributaries, *for*
convened at 9:50 a.m., Tuesday, January 4, 1966, at the
Auditorium, Prudential Building, Chicago, Ill.

*> includes statements, discussions, and
recommendations on: Description of
surveillance programs, hydraulic
surveys, and related information.*

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* * *

Opening Statement - Mr. Stein

P R O C E E D I N G S

OPENING STATEMENT

BY

MR. MURRAY STEIN

The conference is open.

This technical session of the conference in the matter of pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Wolf Lake, Michigan and their tributaries, is being held under the provisions of section 10 of the Federal Water Pollution Control Act, as amended. The Secretary of Health, Education, and Welfare, is required to call a conference of this type when, on the basis of reports, surveys, or studies he has reason to believe that pollution of interstate waters subject to abatement under the Federal Act has occurred.

The purpose of the conference is to bring together the State water pollution control agencies, the representatives of the Department of Health, Education, and Welfare, and other interested parties to review the existing situation, to appraise what has been done, to lay a basis for future action by all parties concerned, and to give the

Opening Statement - Mr. Stein

States, localities, and industries an opportunity to take any remedial action which may be indicated under State and local law.

We have had conferences now throughout the country involving more than a thousand cities and involving more than a thousand industries. We strongly support the conference technique, and we measure our success by the situations which are solved at the conference stage rather than by the court actions we bring.

To date we have only had to go to court once against one city. We have only had to go to a hearing four times. All the other cases have been resolved at the conference stage. I believe that this case will follow the same pattern, and I think this speaks very well for our State-Federal cooperative program.

As specified in section 10 of the Federal Water Pollution Control Act, the official water pollution control agencies have been notified of this conference. These agencies are the Illinois State Sanitary Water Board, the Indiana Stream Pollution Control Board, and the Metropolitan Sanitary District of Greater Chicago.

Illinois will be represented by Mr. Clarence Klassen, who is accompanied by Mr. Richard Nelle.

Indiana will be represented by Mr. Blucher

Opening Statement - Mr. Stein

Poole, accompanied by Mr. Perry Miller.

The Metropolitan Sanitary District will be represented by Colonel Frank Chesrow.

Mr. H. W. Poston, Department of Health, Education, and Welfare, with headquarters in Chicago, Illinois and the regional program director, has been designated as conferee for the Federal Government.

My name is Murray Stein. I am from Washington, D.C., headquarters of the Department of Health, Education, and Welfare. I have been designated as chairman of the conference by the Secretary, and I am also designated as his representative.

The representatives of the official water pollution control agencies are privileged to bring whomever they wish to the conference and have them participate in it. However, this is a conference between the official agencies and the representatives of the Department of Health, Education, and Welfare. These parties constitute the conferees.

Both the States and the Federal Government have responsibilities in dealing with interstate water pollution control problems. The Federal Water Pollution Control Act declares that the States have the primary rights and responsibilities for taking action to abate and control interstate pollution. The function of our Department is to

Opening Statement - Mr. Stein

encourage the States in these activities. However, the Department of Health, Education, and Welfare is charged by law with specific responsibilities in connection with interstate pollution control problems.

The Federal Water Pollution Control Act provides that pollution of interstate waters, whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters, which endangers the health or welfare of persons in a State other than that in which the discharges originate, is subject to abatement.

The first session of this conference was held in Chicago March 2-9, 1965. Many of you were present at that conference. I think it is fair to say that throughout the country we have never had a more diverse or complicated situation or case to deal with than we have had in the lower end of Lake Michigan. The conference, consequently, took more than a week.

At that session of the conference the conferees at this table unanimously agreed to the following conclusions and recommendations:

1. Interstate pollution endangering the health and welfare of persons in a State other than that where the discharges originate exists in the waters of the Grand

Opening Statement - Mr. Stein

Calumet River, Little Calumet River, Lake Michigan and their tributaries. Such pollution is subject to abatement under the Federal Water Pollution Control Act.

2. Sewage and industrial waste from sources in Indiana (the Little Calumet River area and Grand Calumet area and Indiana Harbor area) contribute to such interstate pollution in Illinois.

3. There is no evidence of such interstate pollution from discharges in the Burns Ditch area in Indiana.

4. Municipal and industrial waste from sources in the Calumet area in Illinois contributes to such interstate pollution in Indiana.

5. Cognizance is taken of the efforts in both States to abate such interstate pollution but action taken to date is not adequate and such interstate pollution still exists.

6. The nature of the delays in abating such interstate pollution include the complexity of the problem and the concentration of population and industry.

7. To initiate a program of immediate remedial action to protect water quality in the area for the maximum number of legitimate uses, the conferees will use as a guide for water quality at the Chicago Water Works intakes the "Recommended Quality Criteria Goals, Lake Water at Chicago

Opening Statement - Mr. Stein

Intakes" presented by the Department of Water and Sewers of the City of Chicago at this conference. The conferees will use as a guide for bacterial water quality at bathing beaches covered by this conference the requirement that receiving water shall be considered unsuitable for bathing if the coliform concentration exceeds 1000 per 100 ml.

8. The conferees will establish a technical committee as soon as possible which will evaluate water quality criteria and related matters in the area covered by the conference and make recommendations to the conferees within six months after the issuance of the summary of the conference.

9. The Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board and the Metropolitan Sanitary District of Greater Chicago will institute immediate action in their respective jurisdiction that all sewage receive at least secondary treatment plus adequate effluent disinfection within one year after the issuance of the summary of the conference.

10. The Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board and the Metropolitan Sanitary District of Greater Chicago will institute immediate action in their respective jurisdiction to insure that industries will institute housekeeping practices which will

Opening Statement - Mr. Stein

minimize the discharge of wastes from industrial sources and to insure optimum operation of sewerage systems and sewage treatment facilities to minimize by-passing of sewage treatment plants or other practices that result in the discharge of untreated or partially treated wastes and report on these activities to the conferees within six months after the issuance of the summary of this conference.

11. The Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board, the Metropolitan Sanitary District of Greater Chicago will undertake action to insure that industrial plants discharging wastes into waters within their respective jurisdictions institute programs of sampling their effluents to provide information about waste outputs needed by these agencies in the carrying out of their functions. Such information will be maintained in open files by these agencies for those having a legitimate interest in the information and the agencies will report to the conferees on this activity within six months after the issuance of the summary of this conference.

12. The Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board and the Metropolitan Sanitary District of Greater Chicago, maintaining close liaison with the technical committee created by the conferees, will develop a time schedule for the construction of necessary

Opening Statement - Mr. Stein

industrial waste treatment facilities. Such a schedule will be submitted to the conferees for their consideration within six months after the issuance of the summary of this conference.

13. The Thomas J. O'Brien Lock is to be placed in operation to protect water quality of Lake Michigan and prevent backflow to the Lake. This should be done as soon as possible but not later than January 1, 1966.

14. Surveillance will be the primary responsibility of the Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board and the Metropolitan Sanitary District of Greater Chicago. The Department of Health, Education, and Welfare will make available a resident technical group and visiting groups of experts which will assist the State agencies and the Metropolitan Sanitary District of Greater Chicago at such time as requested by them.

15. The conference may be reconvened on the call of the chairman.

As recommended by the conferees, a technical committee was established to evaluate and recommend water quality criteria. I would like to indicate that in my experience in this field, which is extensive I think, perhaps not as extensive as that of some of the people here but I have been working with this since 1948, I have never seen a better

Opening Statement - Mr. Stein

cooperative effort than that put in by this technical committee.

The committee, as you will hear, had representatives of the States of Illinois and Indiana, the Metropolitan Sanitary District, the Federal Government and industrial representatives representing the petroleum industry and the steel industry.

I think the best of goodwill was evidenced by all hands on the committee.

I also expect that we will hear from the committee about its recommendations. To my knowledge, this may be a landmark and the first time that a committee representing various levels of government, district, State, Federal, and industrial representatives have gone over in detail specifically the kind of requirements and criteria needed to protect water quality and have reached an accommodation. In my opinion this shows that it can be done. If we can arrive at accepting this accommodation, I think not only will we be way ahead in the lower end of Lake Michigan but we very well may have set a model for the rest of the country to follow.

All the conferees will be called upon to make statements. The conferees, in addition, may call upon participants whom they have invited to the conference to

Opening Statement - Mr. Stein

make statements. At the conclusion the conferees will be given an opportunity to comment or ask questions.

At the conclusion of all the statements we will have a discussion among the conferees to try to arrive at agreement on the facts of the situation. The conferees will probably convene in executive session and reappear to make an announcement.

Now a word about the procedure governing the conduct of the conference. A record and verbatim transcript will be made of the conference by Mr. Joe McLaughlin. Mr. McLaughlin is making this transcript for the purpose of aiding us in preparing the summary and providing a complete record of what is said here.

We will make copies of the summary available to the official water pollution control agencies of Illinois, Indiana and the Metropolitan Sanitary District of Greater Chicago for distribution. If you want copies of that summary and transcript, we suggest you get in touch with them. The transcript is generally available within two or three months after the conference, and the summary may be available much sooner.

Now, I would suggest that all speakers and participants other than those at this table come up to the lectern to make their statements. You will find it a rather

Opening Statement - Mr. Stein

tortuous route through the wings.

Before going on I would like to take one minute, because today we are indeed privileged in having one of the members of Congress -- and my boss -- here, a man who has been vitally interested in water pollution control for a long time, one who assiduously looks after Chicago's interests. I don't know that you have ever had a better guardian in my opinion or a man who did his homework so well and who was so adept at persuasion in looking after Chicago's interests.

I think as long as I can remember this Congressman has been in touch with us several times during the session, and I don't think that there was ever any issue involving water in the Federal government where his influence has not been felt and his counsel has not been sought.

He has contributed immeasurably to the legislation and philosophy of the Federal program and in no small measure is responsible for our agency.

Congressman Yates, would you stand up?

(Applause.)

I would like to call on Mr. Poston for the Federal presentation.

Mr. Poston.

H. W. Poston
STATEMENT OF H. W. POSTON, CONFEREES,
REPRESENTING FEDERAL WATER POLLUTION
CONTROL ADMINISTRATION

MR. POSTON: Thank you, Mr. Stein.

As many of you know, the agency that Mr. Stein and I represent here today is very young. The fact is it is only four days old. When we met in the first session of the conference at McCormick Place in March of 1965 we represented the Public Health Service. However, the Water Quality Act of 1965 created the Federal Water Pollution Control Administration, so this is the first meeting of this type under the new Federal Water Pollution Control Administration.

At the March 1965 conference on pollution of Lake Michigan and streams of the Calumet area, several recommendations of action were made in concerted effort to clean up these waters. Certain of these recommendations placed definite responsibilities on the Department of Health, Education, and Welfare. What these responsibilities are and how they are being carried out will be reported by our technical people.

Recommendation No. 8 called for the conferees to establish a technical committee as soon as possible which will evaluate water quality criteria and related matters and

H. W. Poston

make recommendations to the conferees.

The technical committee was formed immediately after the March conference. Representatives of State and Federal regulatory agencies, industry, municipalities and recreation and conservation interests served on the committee.

To head such a committee we surveyed the field to get qualified individuals. We feel very fortunate in having Mr. Francis Kittrell, a nationally recognized water pollution control expert and currently Chief of the Water Pollution Evaluation Unit at the Administration's Sanitary Engineering Center in Cincinnati. He has served as chairman.

Other members on the committee were Mr. Perry Miller of the Indiana State Board of Health, Mr. R.S. Nelle of the Illinois Department of Public Health, Mr. H.H. Gerstein of the Chicago Department of Water and Sewers, Dr. A.J. Kaplovsky of the Metropolitan Sanitary District of Greater Chicago, Dr. C. A. Bishop of the United States Steel Corporation, Mr. R. C. Mallatt of the American Oil Company, and Mr. Harold C. Jordahl, United States Department of Interior, for which he is the regional coordinator.

Fourteen technical committee meetings, covering 25 days, were held during the past six months. The task of this committee involved complex and extremely difficult

H. W. Poston

considerations and decisions, and we want to take cognizance of the formidable obstacles which these experts faced.

To paraphrase a famous Englishman's remarks with respect to the committee members, much blood, toil, sweat, and probably even a few tears went into these deliberations.

On behalf of the Federal Water Pollution Control Administration I want to take this opportunity to thank each one of these experts publicly.

The conferees also met several times to discuss matters related to the conference. One of these meetings dealt with the disposal of dredged material in Lake Michigan. All conferees agreed that the practice of disposing of dredged material in the Lake must be stopped and have taken positive action to see that it is stopped.

Mr. Chairman, I would like to introduce at this time the letter of policy jointly agreed to and distributed to the conferees on December 21, 1965.

MR. STEIN: Without objection that will be done.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

December 21, 1965

Refer to: WS&PC

Mr. Frank W. Chesrow, President
Metropolitan Sanitary District
100 East Erie Street
Chicago, Illinois 60611

Dear Mr. Chesrow:

In response to a request for information concerning policy for dumping of dredged material into Lake Michigan, a conference telephone call was arranged last summer between:

C. W. Klassen	Illinois Sanitary Water Board
F. W. Chesrow	Metropolitan Sanitary District
B. A. Poole	Indiana Water Pollution Control Board
H. W. Poston	Program Director, Public Health Service

The question of attitude of the conferees of the Calumet Area-Lake Michigan enforcement conference was the subject of the conference call. During the course of this call, it was agreed as follows:

1. Dredged material from the Bubbly Creek branch of the Chicago River shall not be dumped into Lake Michigan or its tributaries because this dredged material is primarily composed of deleterious waste solids.
2. There shall be no intentional transfer of deleterious waste solids and other such material from one area of Lake Michigan and its tributaries to another area of Lake Michigan and its tributaries.
3. The conferees shall further explore the current policy of dumping inert material in Lake Michigan and its tributaries.

The above agreements extend only to the conference area, and have been communicated to the Conference Chairman, Mr. Murray Stein.

Sincerely yours,

H. W. Poston
Regional Program Director
Water Supply and Pollution Control

cc: Murray Stein, Washington, D.C.
C. W. Klassen, Springfield, Illinois
B. A. Poole, Indianapolis, Indiana

F I L E C O P Y

H. W. Poston

MR. POSTON: Another responsibility was spelled out in the Recommendation No. 14, which stated that surveillance would be the primary responsibility of the Indiana Stream Pollution Board, the Illinois Sanitary Water Board and the Metropolitan Sanitary District of Greater Chicago. The Department of Health, Education, and Welfare will make available a resident technical group to assist at such times as requested by them.

Requests were received from the State regulatory agencies, and a seven-man staff was organized in June of 1965 by the Department of Health, Education, and Welfare to perform surveillance functions.

There has been a close cooperation between the regulatory agencies and our surveillance team in a beach-sampling program. Laboratories that worked together in the overall program were the Chicago Water Department, the Chicago Park District, Metropolitan Sanitary District of Greater Chicago, Indiana State Board of Health, Illinois State Department of Health, Gary-Hobart Water Company, Inland Steel Company, American Oil Company, and the Great Lakes-Illinois River Basin Project of our Federal Water Pollution Control Administration.

A report of this surveillance activity has been submitted to the conferees, and a limited number of copies of

this report are available for other interested parties.

We will hear a summary discussion of this report with the conclusions from Mr. Grover Cook, who is Chief of our Enforcement Section in our Chicago Regional Office. I would like to ask Mr. Grover Cook at this time to give this summary discussion.

Mr. Cook.

Grover Cook

STATEMENT OF GROVER COOK, CHIEF,
ENFORCEMENT ACTIVITIES, REGION V,
FEDERAL WATER POLLUTION CONTROL
ADMINISTRATION

MR. COOK: I am going to summarize a report entitled "Report on the Calumet Area Surveillance Program." I would request, Mr. Chairman, that this be entered into the record.

MR. STEIN: The full report will be entered into the record without objection.

(The report referred to follows:)

Grover Cook

REPORT ON THE
CALUMET AREA SURVEILLANCE PROGRAM

BY

DEPARTMENT OF HEALTH, EDUCATION & WELFARE

FOR THE PERIOD

JUNE THROUGH NOVEMBER, 1965

ILLINOIS-INDIANA

I FOREWORD

This report presents an evaluation of the present water quality in the Calumet Area based primarily on the sampling program of the Department of Health, Education, and Welfare's Calumet Area Surveillance Project. The exception to this is the evaluation of the bacteriological quality of the water at the six Lake Michigan beaches within the study area. Three of these beaches are in each of the two States involved and the Surveillance Project is the only one of the four cooperating agencies that sampled all six beaches. Beach sampling data was freely exchanged by all cooperating agencies. Results from each of the weekly sampling runs by the Calumet Area Surveillance Project have been forwarded to the responsible State and local agencies usually within two weeks after the samples were obtained.

Grover Cook

II. SUMMARY AND CONCLUSIONS

1. Based on the conferees' criteria of bathing water having a total coliform count of less than 1000 per 100 milliliters, the water quality at the six Lake Michigan beaches in the Calumet Area was unsuitable for bathing from 31 per cent to 100 per cent of the time.

2. The Lake Michigan beachers in the Calumet Area are subject to varying degrees of pollution from external sources making the water at times unsuitable for bathing. The Calumet Park, Whiting, and Hammond beaches are subject to periods of extremely heavy pollution.

3. Indiana Harbor is grossly polluted with very high total coliform and fecal streptococcus counts. Phenols, though reduced from 1963 levels, are still high enough to cause taste and odor problems at times in near municipal water supplies. Total phosphates average almost five times the value required for algae blooms, also there are still many visual signs of pollution being dumped into this stream system. This polluted water is flowing into Lake Michigan at a dry weather flow estimated to be 2,300 cubic feet per second.

4. Calumet Harbor sampling indicates a slight

Grover Cook

increase in the dissolved oxygen content, a decrease in the phenols, and bacterial contents that were slightly higher than obtained during the 1963 sampling period. Iron, ammonia nitrogen, and total dissolved solids are all above the background levels found in Lake Michigan. Average total phosphates are five times the value required for algae blooms. There is also visual evidence of large quantities of pollution being dumped into lower portions of the Calumet River and Calumet Harbor. The operation of the O'Brien Lock and Dam and the slightly higher water levels of Lake Michigan in 1965 have partly reduced the pollution to Lake Michigan from this source.

5. The Grand Calumet River at the State line is still grossly polluted as is evidenced by very high bacterial counts. Ten per cent of the samples collected in 1965 had a zero dissolved oxygen content and 25 per cent had an oxygen content of less than one milligram per liter (mg/l) indicating that septic conditions still exist. Pollution is also indicated by the high biochemical oxygen demand, chemical oxygen demand, phenol, and dissolved solid values found during the sampling period.

6. The Little Calumet River at the State line is still grossly polluted, although there has been an improvement since the 1963 sampling period. Bacterial counts are

Grover Cook

still above acceptable levels, 15 per cent of the samples had dissolved oxygen content of zero and 40 per cent had an oxygen content of less than one milligram per liter (mg/l) indicating that septic conditions still exist. Biochemical oxygen demand, chemical oxygen demand, total phosphates, sulfates, and dissolved solids, although less than 1963 values, are still high. The improvement in quality of water is probably due in part to the treatment of a portion of the sanitary wastes from the communities of Highland and Griffith by the Hammond Sanitary District. However, the stream is still polluted, especially if the recreational benefits that this stream can provide to the area are considered.

Grover Cook

III INTRODUCTION

Authority and Organization

A conference on pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Wolf Lake, Lake Michigan and their tributaries (Indiana-Illinois), called by the Secretary of Health, Education, and Welfare under the provisions of Section 8 of the Federal Water Pollution Control Act (33 USC 466 et. seq.), was held in Chicago, Illinois March 2-9, 1965.

Paragraph No. 14 of the Conclusions and Recommendations of the Conferees for this Conference provided that "Surveillance will be the primary responsibility of the Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board and the Metropolitan Sanitary District of Greater Chicago. The Department of Health, Education, and Welfare will make available a resident technical group and visiting groups of experts which will assist the State agencies and the Metropolitan Sanitary District of Greater Chicago at such time as requested by them."

The State of Indiana, on April 6, 1965, and the State of Illinois, on April 16, 1965 requested an extensive sampling program by the Federal government to monitor the

Grover Cook

water quality in the Calumet Area. These requests accompanied the sampling program proposed by them within their respective jurisdictions. The Metropolitan Sanitary District has not formally requested a sampling program, but has requested laboratory assistance in the analysis of samples they have collected and in special studies they have conducted on chlorination of the effluent from their sewage treatment plant. The Calumet Area Surveillance Project was organized in the latter part of June, 1965 to fulfill the requirements of paragraph No. 14 and the requests of the States.

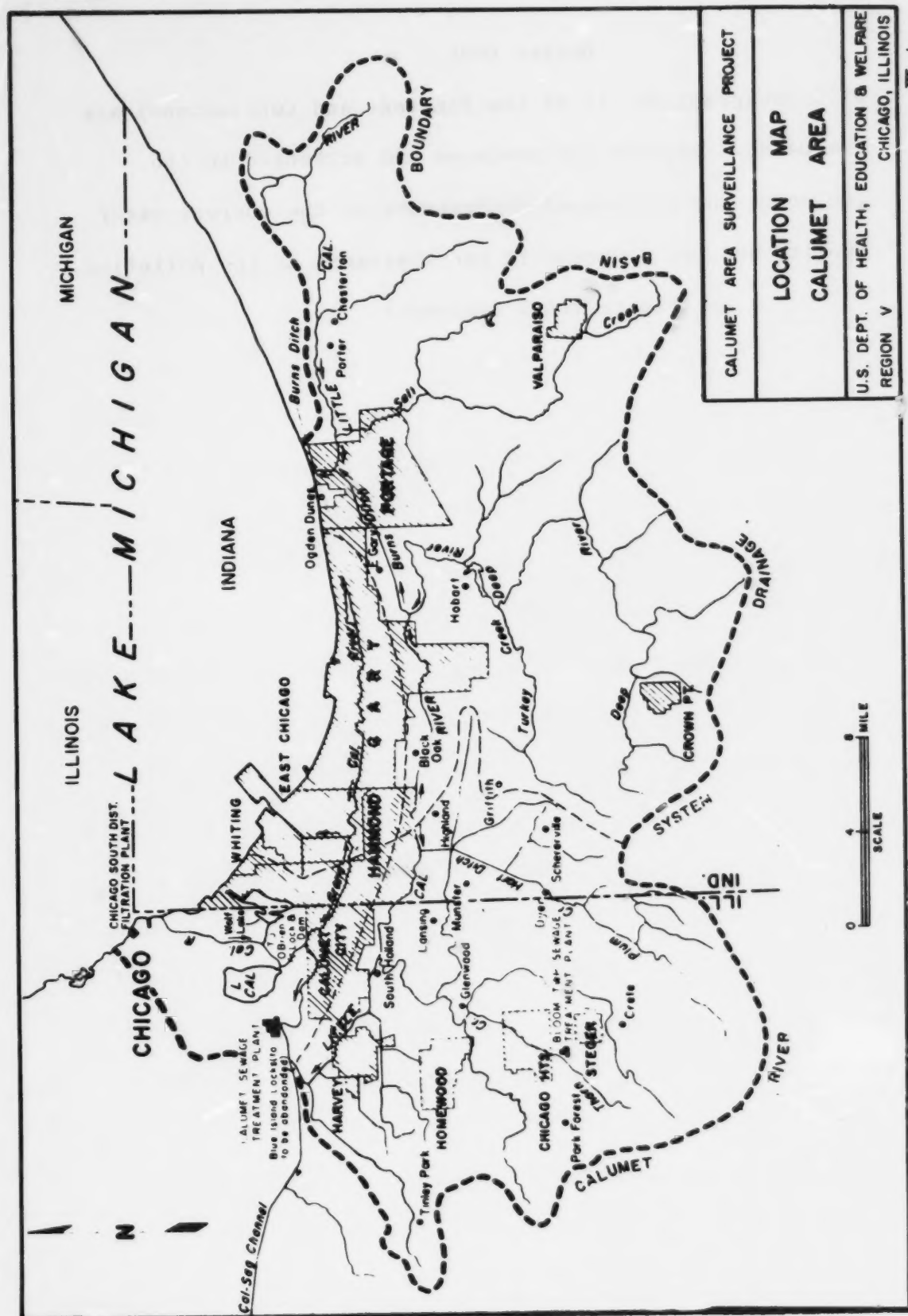
Purpose and Scope

The purpose of the Calumet Area Surveillance Project is to assess the progress in the abatement of pollution in the conference area in cooperation with appropriate State and local agencies. This is being accomplished through sampling programs to monitor the water quality at various locations within the conference area. Stream flow measurements are being made so that laboratory analyses in milligrams per liter can be converted to pounds per day. The information obtained through Federal, State and local sampling programs and the information furnished by the industries to the State or other responsible agency on the quality and quantity of their waste flows (in accordance

Grover Cook

with paragraph No. 11 of the Findings and Conclusions) are evaluated. Reports are prepared and presented to the conferees and reconvened conferences on the current water quality and the progress in the abatement of the pollution.

(Figure III-1 follows:)



Grover Cook

IV DESCRIPTION OF SURVEILLANCE PROGRAM

Present Staffing

The Calumet Area Surveillance Project began in the latter part of June 1965 with the assignment of six persons to the staff. The professional staff consists of the Project Director, a sanitary engineer, two aquatic samplers, a chemist, and a microbiologist. Technical assistance has been provided by the Great Lakes-Illinois River Basins Project.

Beach, Stream, and Harbor Sampling

Sampling of six Lake Michigan beaches on a weekly basis was initiated in the latter part of June. Rainbow and Calumet Park Inner and Outer beaches were the three beaches sampled in Illinois. Hammond, Whiting, and E. Chicago beaches were the Indiana beaches sampled. This sampling program was coordinated with three other agencies who were sampling certain of these beaches. Cooperating agencies are the Indiana State Board of Health, the Illinois Sanitary Water Board, and the Chicago Park District. Beaches were sampled for total coliform and fecal streptococci. The results of the Surveillance Project's beach sampling were transmitted to other interested and cooperating agencies usually on the third day after the samples were taken. Results were also received from the other cooperating agencies. By

Grover Cook

agreement with the other agencies the Surveillance Project sampled on Tuesday. In addition, one Sunday sampling run was made to determine conditions under the increased weekend bathing load. In September additional samples were obtained by boat approximately 1/4 mile off the beach opposite the regular wade-in stations. Fecal coliform determinations were made in addition to total coliform and fecal streptococci. The location of beaches sampled and the results of sampling are shown under Microbiological Quality of Water.

Stream sampling was initiated the last week in June with five stations that could be sampled from bridges. The Grand Calumet was sampled at Broadway Avenue in Gary, Pennsylvania Railroad Bridge and the Baltimore and Ohio Chicago Terminal (B&O C.T.) Railroad Bridge. Indiana Harbor Canal was sampled at Dickey Road and the Little Calumet River at Wentworth Avenue. When the project boat became operational in July, four additional sampling stations were added. These were the Calumet River at its mouth, Calumet Harbor opposite the mouth of the river at the State line, Indiana Harbor at Harbor Light-Inshore (mouth of Indiana Harbor Canal) and Indiana Harbor at Harbor Light (East Breakwater).

In August the Broadway Avenue sampling station was terminated and the Indiana Harbor Canal was sampled at 151st Street instead. The Calumet Harbor State-line station moved out to mid-channel, about 3,500 feet from the mouth of

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the river to obtain a more representative sample of the water quality in the Harbor. Sampling was also initiated at the Indiana Harbor Belt Railroad Bridge across the Grand Calumet River. This bridge is closer to the State line than the B&O C.T. Railroad Bridge. After a period of duplicate sampling to coordinate the results of the two stations sampling at the B&O C.T. station was discontinued. Wolf Lake at the State line and Wolf Lake outlet were added to the regular sampling stations in October. These stream and harbor stations are sampled for microbiological and chemical analysis. The location of these stream and harbor sampling stations were given in the sections on Microbiological and Chemical Quality of the Water.

Hydraulic Surveys

No gaging stations are maintained by the U. S. Geological Survey in the Grand Calumet-Indiana Harbor drainage system. Therefore, six water level recording stations have been established in this basin. Flow measurements are being conducted at each station at several different volumes of flow so that rating curves can be developed. These gages are located on the bridges that cross the Grand Calumet River at Hohman Avenue, Kennedy Avenue, Indianapolis Blvd., Industrial Highway, and Bridge Street, and at the bridge across the Indiana Harbor Canal at Chicago Ave. Since the

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greater volume of water discharged to Lake Michigan from the Indiana Harbor Canal is a result of industrial waste discharged to the canal below Chicago Ave., the canal was not gaged below this point. Fluctuations in lake level distort the information provided by water level recording gages installed below this point to such an extent that gages are not considered feasible.

Special flow area and velocity measurement studies are planned for Indiana Harbor Channel to correlate the flows determined at the upstream gaging stations with the waste flow information provided by the industries through the State of Indiana.

Information obtained from the U. S. Geological Survey and the Metropolitan Sanitary District will be used as the basis for stream flow calculations in the Little Calumet and Calumet Rivers. However, it is planned to conduct some flow measurement in Calumet River and Calumet Harbor to determine the effects of flow reversals in the Calumet River and wastes discharged directly to the harbor. The location of these gaging stations is shown on the map of the Calumet Surveillance Area, Figure IV-1.

(Figure IV-1 follows:)

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Biological Surveys

The kinds and numbers of aquatic plants and animals, inhabiting a particular body of water and the stream or lake bottom beneath it, reflect the quality of water that has generally prevailed in the area for an extended period of time. Some plants and animals are capable, by virtue of physiological features or living habits, of withstanding polluted conditions and will multiply rapidly when competition with less tolerant forms is eliminated. Examples of pollution-tolerant animals are the sludgeworms, bloodworms, leaches, and pulmonate snails, that exist in the decaying organic sediment which builds up from the settleable organic solids present in most waste discharges. A benthic (bottom-dwelling) population consisting of many kinds of organisms with low numbers of each species is typical of unpolluted waters.

The continuous or sudden introduction of toxic wastes and settleable solids, as well as oxygen-consuming materials could also alter the composition of the community by destroying the sensitive forms and giving more living room to the tolerant kinds. A balanced population would not be re-established automatically by the sudden return to optimum water quality conditions, because the lengths of the life cycles of the organisms vary from weeks to years.

Fifteen substrate samplers of the Dendy type have been made and used in the waters of the Calumet Area. These substrates have three types of surfaces for growth of aquatic life. One is made up of broken clam shells, a second of coarse sand, and the other of hardwood sawdust. The samplers are placed in the streams for two or more weeks at a time. The organisms collected on these samplers will be compared with the organisms found by bottom sampling in corresponding areas. The organisms collected on the sampler are less affected by silt and oil pollution than those actually on the bottom of the stream.

Surveys for bottom-dwelling animals, attached algae and rooted vegetation are to be performed biennially. Studies will be seasonal because of the wide differences in life cycles of bottom-dwelling animals. The information gained by these studies will not only indicate subtle changes in water quality over a two-year period, but may also reveal the presence of unseen pollutants, organic toxicants and toxic metals. They will also provide evaluations as to the effects on the biota of organic suspended matter and silt.

Automatic Monitoring

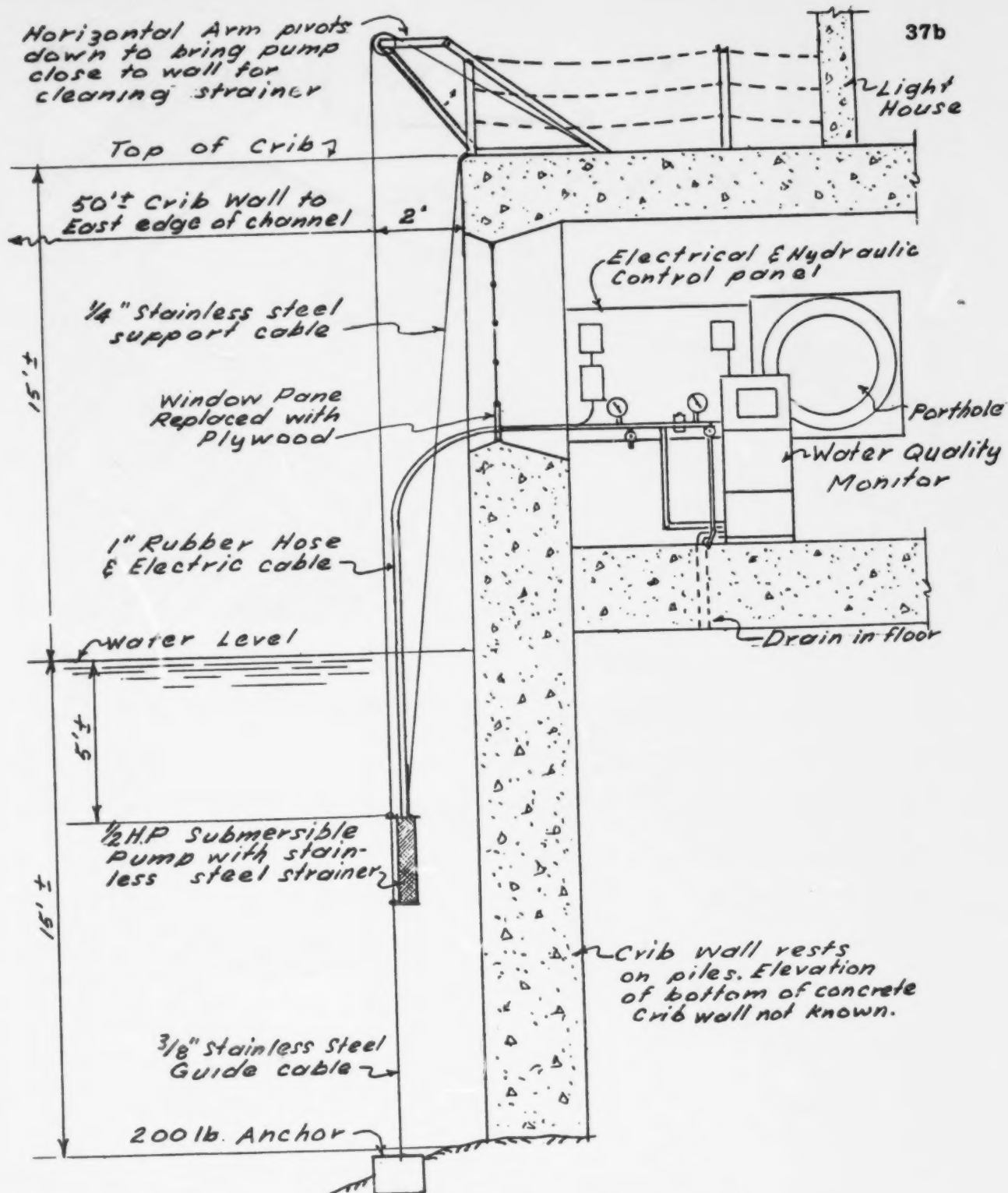
Many operations of the industries in the basin require discharge of wastes on a batch basis, and wastes from these tanks may be dumped at any time of the day, week or month, depending on the needs of the industry. These

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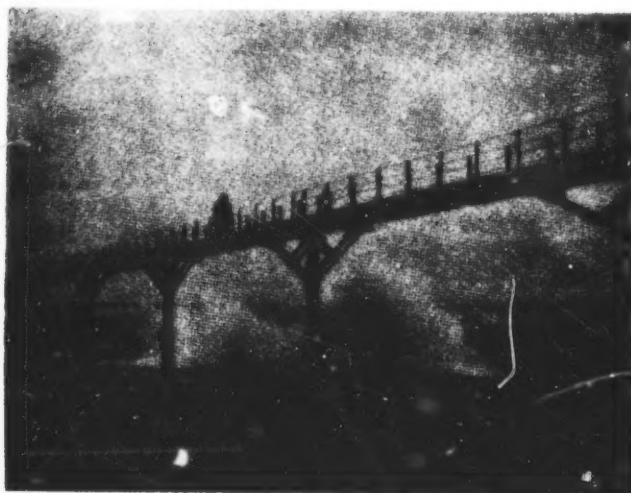
discharges and accidental spills of oil or other chemicals could pass into Lake Michigan or down the Illinois River unobserved by a once-a-week sampling program.

An automatic water quality monitoring station has been installed at the Indiana Harbor East Breakwall Inner Light. Details of this station are provided in Figures IV-2, IV-3, IV-4 and IV-5. The monitor has been continuously recording the dissolved oxygen, pH, conductivity and temperature of the water flowing past this point into Lake Michigan since December 2. Weekly sampling for complete chemical and bacteriological analysis at two locations in Indiana Harbor will continue. The results obtained from the two types of sampling will be correlated for the parameters that are duplicated. From this information and extra samples that will be obtained when high and low limiting values are exceeded on the monitor a more thorough evaluation of the quantities of wastes entering Lake Michigan from Indiana Harbor can be made.

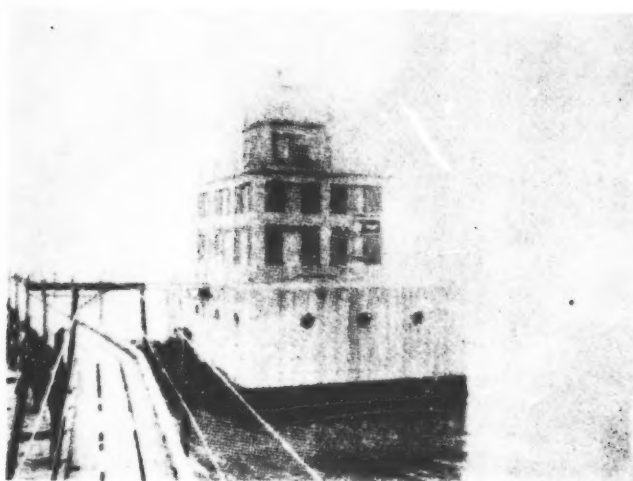
(Figures IV-2, IV-3, IV-4 and IV-5 follow:)



ELEVATION SECTION
 WATER QUALITY MONITORING FACILITY
 INDIANA HARBOR
 DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
 Scale 1" = 4'

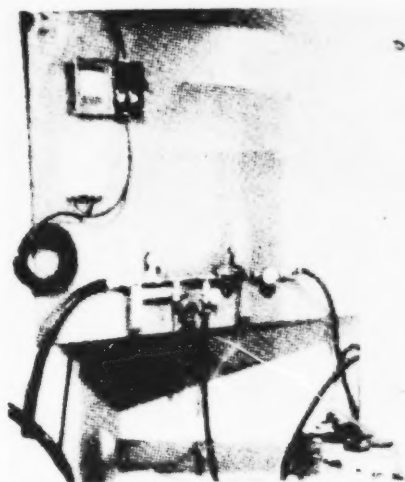


One- half mile of catwalk is the access route to the monitoring station.

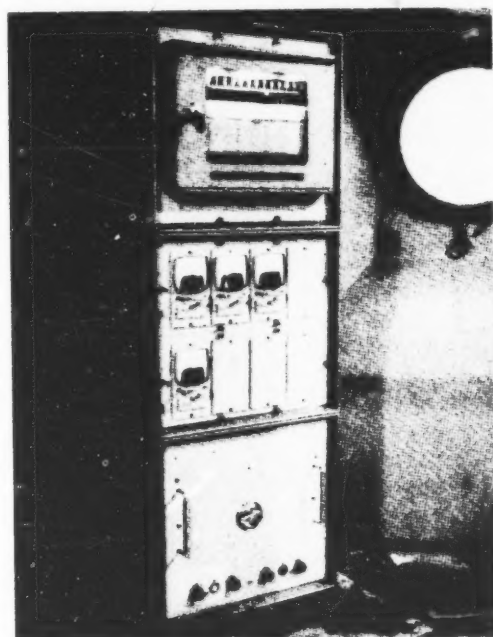


Lighthouse in which the monitor is housed.

INDIANA WATER QUALITY MONITOR



Monitoring instrument and control panel installed in lighthouse base



Monitoring instrument. Top section houses chart recorder.

INDIANA WATER QUALITY MONITOR

IV-5

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A second automatic water quality monitor is being installed at the Calumet River North Pier Light. This monitor will record dissolved oxygen, Ph, conductivity and temperature of the water at the mouth of the Calumet River. Information obtained from this monitor will also be correlated with the analysis for chemical and bacteriological data obtained from the weekly sampling program.

The monitor that is now installed will be replaced in the spring with a monitor that will be equipped with an alarm system which will be activated when a parameter varies beyond a specified limit. Upon activation of the alarm a sample will be collected so that it can be fully analyzed in the Project's laboratory. Field crews will be dispatched to obtain and preserve the sample as required, and investigate the source of waste by tracing the spill back to its source. Additional samples and photographs will be obtained if appropriate. Operators of municipal and industrial water supplies will be notified of the approaching pollution so that they might make adequate preparations.

Next year it is planned to install two other monitoring stations. One will be located at the mouth of Burns Ditch to provide a continuous record of the quality of water flowing into Lake Michigan from this rapidly growing area. The fourth monitoring station is to be located on the Calumet

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River in the vicinity of the Blue Island Locks. This station will provide information on the quality of water discharged from the Calumet Area to the Illinois River Basin System.

Other Accomplishments to Date

Two Interim Reports were prepared for the Calumet Area Conferees. These reports included an analysis of the sampling information available to the date of the reports. The first report also included a description of sampling programs in operation by each agency. Fifty-five frequency analysis graphs that were prepared by the Surveillance Program staff engineer were also included. These graphs show the per cent of time that specified levels were exceeded for the given parameters as indicated by existing historical data. The graphs were made at the request of the Calumet Area Technical Committee and have proved most valuable in aiding them in establishing water quality goals. The second report included a recommended minimum sampling program for surveillance of the water quality in the area. This report also contained information on the dredging of the Calumet River and the discharge of this material in Lake Michigan.

A report on the methods of beach sampling and laboratory analysis that were employed this summer was prepared at the request of the technical committee.

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V. MICROBIOLOGICAL QUALITY OF WATER

Introduction

Microbiological information contained in the following text and figures is based on sampling of Lake Michigan beaches, streams, and harbors in the Calumet Area between June 9 and November 23, 1965. However, the study period for beaches was terminated on September 15 with the end of the bathing season. Samples by the Surveillance Project were processed by means of the membrane filter (MF) method to determine total coliform and fecal streptococci counts per 100 milliliter of sample. In the latter part of the summer, fecal coliform determinations were also made to provide supplementary information.

The laboratory methods followed by the Surveillance Project are in accordance with the procedures established in "Standard Methods for the Examination of Water and Wastewater, 1960" except that KF Streptococcus Agar was used instead of M-enterococcus agar. Fecal coliform determinations were made by the MF method and confirmed, using the E.C. medium.

Beach Sampling

Six Lake Michigan beaches in the Calumet Area were sampled during the study period by one or more of the following four cooperating agencies: The Chicago Park District,

Illinois Sanitary Water Board, Indiana State Board of Health, and the Department of Health, Education, and Welfare's Calumet Area Surveillance Project. These agencies freely exchanged their data as rapidly as it became available. The beaches sampled were Rainbow and Calumet Park Inner and Outer beaches in Illinois, and Hammond, Whiting, and E. Chicago in Indiana. The Surveillance Project sampled all six beaches. The Chicago Park District sampled all six beaches except E. Chicago while representatives of the State of Indiana and Illinois collected samples only from the beaches within their respective States.

Procedure

A meeting was held at one of the beaches early in July to aid in standardizing methods for collecting and reporting information on beach samples. This meeting was attended by representatives of Indiana, Chicago Park District and the Surveillance Project. The location of a common sampling point for the three Indiana beaches was established. Also, it was agreed that Indiana and the Surveillance Project would obtain their samples in four feet of water at elbow depth, approximately 18" below the surface. The Chicago Park District and Illinois collected their samples at mid-depth in three feet of water. Also, they collected samples at two locations on Illinois beaches while the Surveillance Program collected samples only off the center of each beach. It was agreed to at the meeting that the samplers should

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collect the sample by inverting the bottle, lowering it to elbow depth, about 18", then collect the sample by sweeping the bottle away from the body. The samples are immediately stored in an ice chest until they can be processed at the laboratory. It was also agreed that the sampler should record the following information at the time of collecting the sample; number of bathers within a one hundred foot radius; air and water temperature; wind speed and direction; cloud cover or weather condition and surf condition.

Illinois, Indiana and the Surveillance Project used the membrane filter technique in processing their beach samples. The Chicago Park District data presented in this report is based on the MPN Method of laboratory analysis. In August the Chicago Park District started processing some samples by both methods. Indiana and the Chicago Park District collected their samples on one day and preserved them on ice until the following day, when they were processed. Illinois and the Surveillance Project processed their samples on the same day they were taken. Variations in results of ten to 15 per cent have been noted in results of thoroughly mixed samples that have been split with a part processed immediately and a part held on ice for 24 hours. Variations were about equally dispersed both higher and lower than the control sample.

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All agencies did not filter the same amounts of original sample. The Surveillance Project filtered 100, ten and one milliliter samples for total coliform and 50 and ten milliliters for fecal streptococci. Plate counts were read only for the plates which came within the preferred counting range. The following quantities of the original sample are filtered after appropriate dilution, when required by the Cooperating agencies.

TABLE V-1

QUANTITY OF BEACH SAMPLE FILTERED TO DETERMINE
BACTERIOLOGICAL COUNTS

AGENCY	TOTAL COLIFORM in ml	FECAL STREPTOCOCCI in ml
Chicago Park District	10	50
Illinois	10, 1, 0.1	50, 10
CASP	100, 10, 1	50, 10
Indiana		
E. Chicago	10, 1	100-10
Hammond	0.1, 0.01	100-10
Whiting	1, 0.1	100-10

Data Analyses

A comparison of the maximum, minimum, arithmetic mean, and median densities for total coliform and fecal streptococci as determined by the four cooperating agencies

are given in Figures V-1 and V-2. The counts obtained by the Calumet Area Surveillance Project (CASP) are generally a little higher than counts by the Chicago Park District and lower than those obtained by Illinois. Indiana had higher counts than the CASP on Hammond Beach, but lower at Whiting and E. Chicago. However, the results by all agencies bear reasonable relationships when compared with each other.

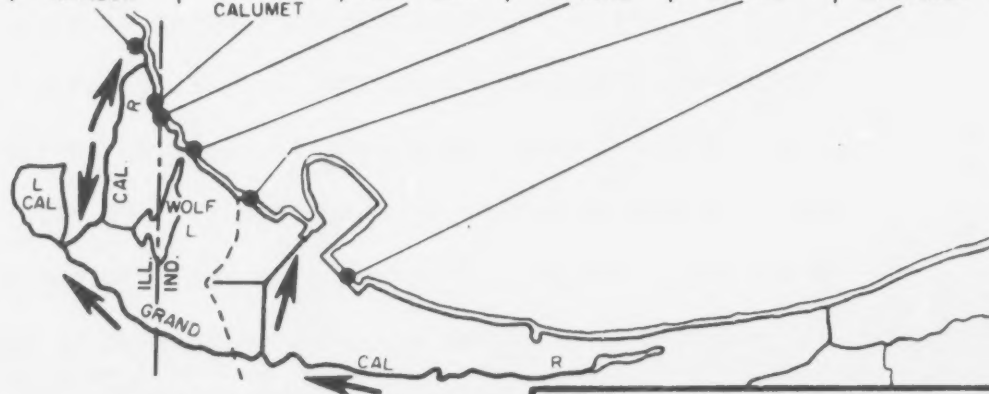
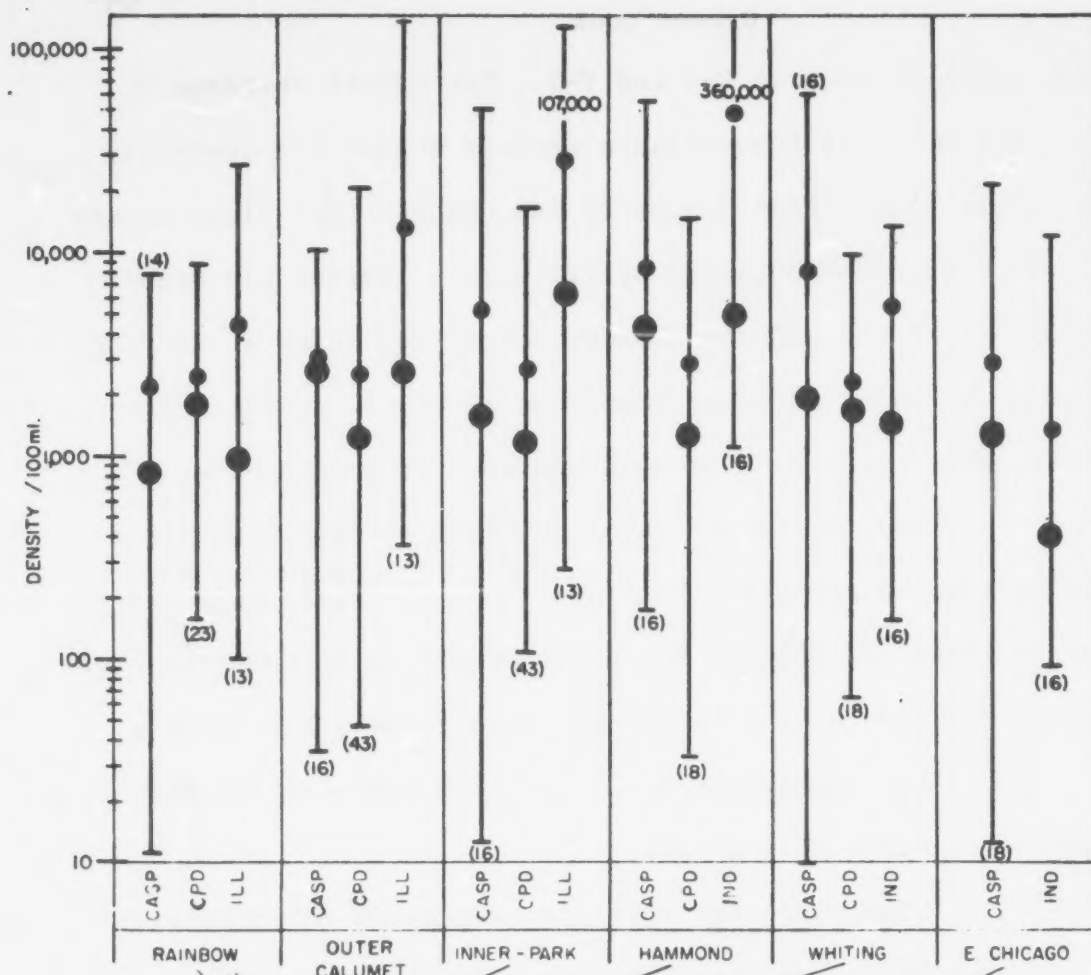
Mean values of fecal coliform as determined from three samples are given in Figure V-3. The extremely high value shown for Hammond Beach was proven to be accurate within 25 per cent by the confirmation test using E.C. medium.

Recommendation No. 7 of the Summary of the March, 1965 conference stated that:

"The conferees will use as a guide for bacterial water quality at bathing beaches covered by this conference the requirement that receiving water shall be considered unsuitable for bathing if the coliform concentration exceeds 1000 per 100 ml."

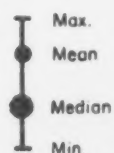
Using this criteria the results of the 1965 beach sampling data were reviewed. The per cent of samples by each agency for each beach that exceeded this criteria of 1,000 coliforms per 100 milliliters is given in table V-2. The total number of days sampled by each agency during the period covered by this report are also given.

(Figures V-1, V-2 and V-3, and Tables V-2 and V-3 follow:)



LEGEND

CASP Calumet Area Surveillance Project
 CPD Chicago Park Dist.
 ILL ILL. State Sanitary Board
 IND IND. State Sanitary Board
 ← Direction of Flow



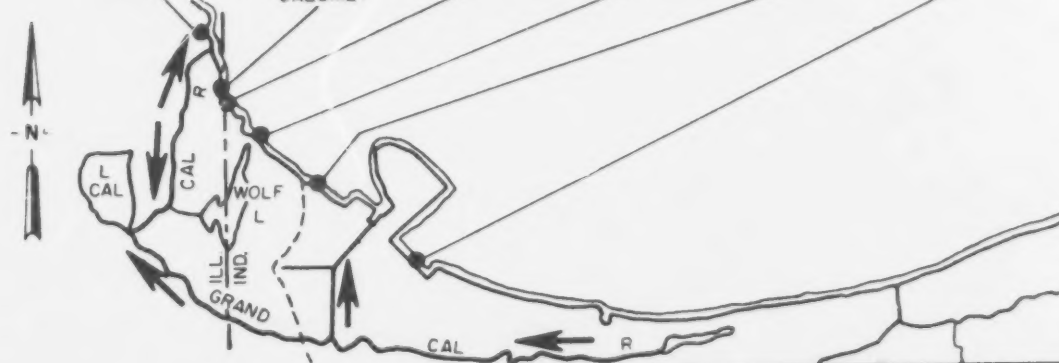
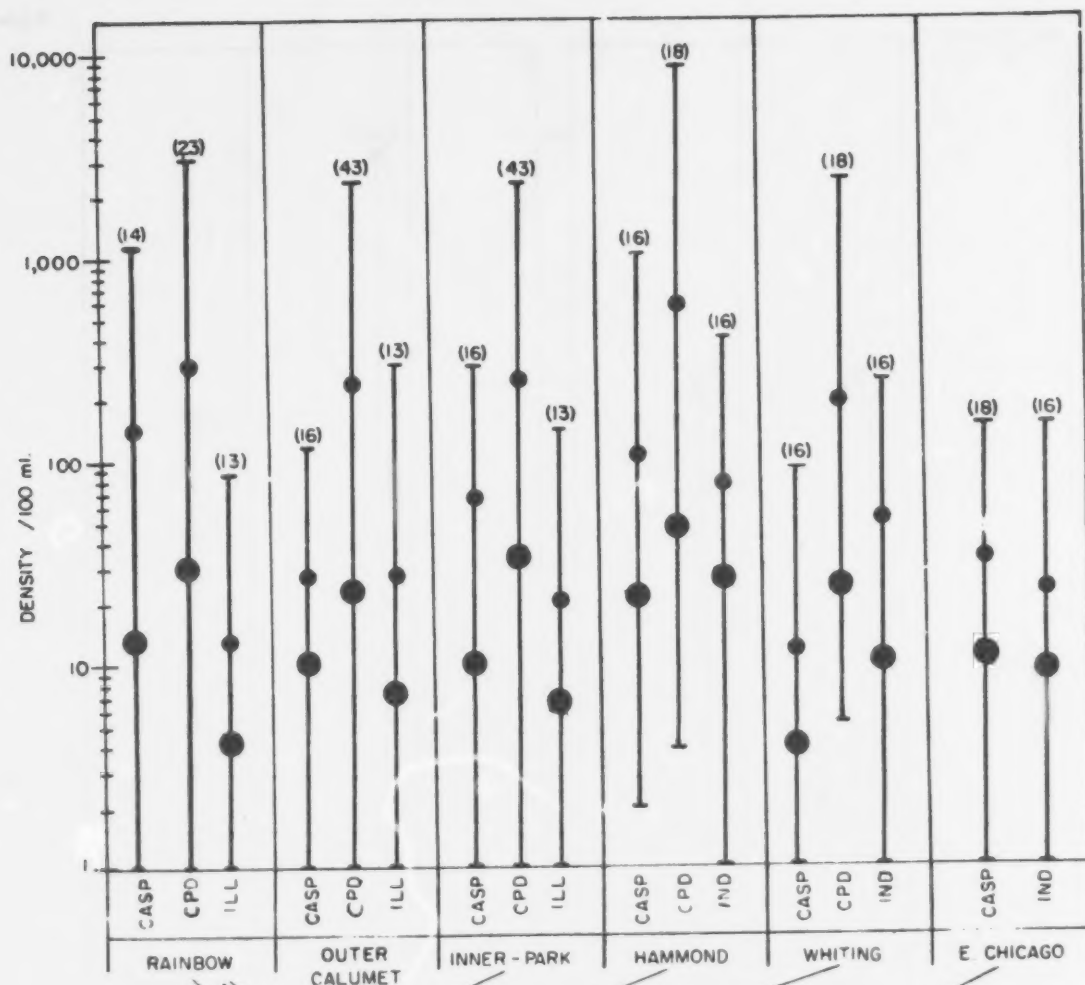
(16) - No Times Sampled

CALUMET AREA SURVEILLANCE PROJECT

BEACH SAMPLING - TOTAL COLIFORM
 MAXIMUM, MINIMUM, MEAN & MEDIAN
 JUNE - SEPT. 1965

U S DEPT OF HEALTH, EDUCATION & WELFARE
 REGION V CHICAGO, ILLINOIS

V-1



LEGEND

CASP Calumet Area Surveillance Project
 CPD Chicago Park District
 ILL. ILL. State Sanitary Board
 IND. IND. State Sanitary Board
 ← Direction of Flow

Max
 ● Mean
 ● Median
 Min.

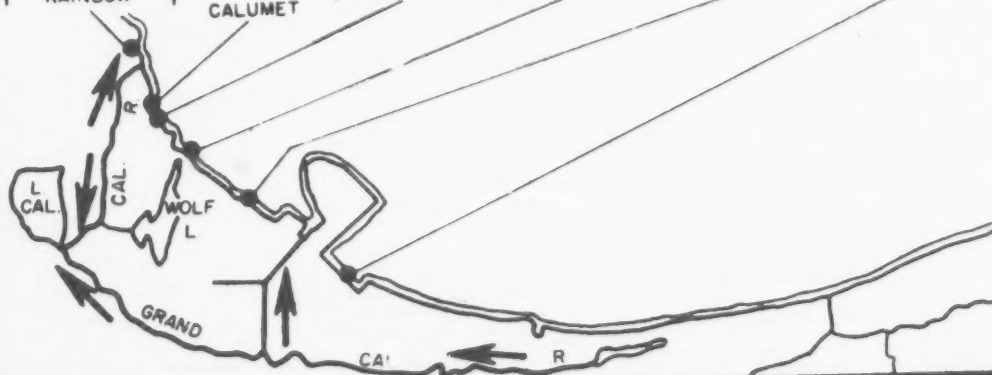
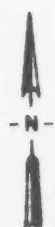
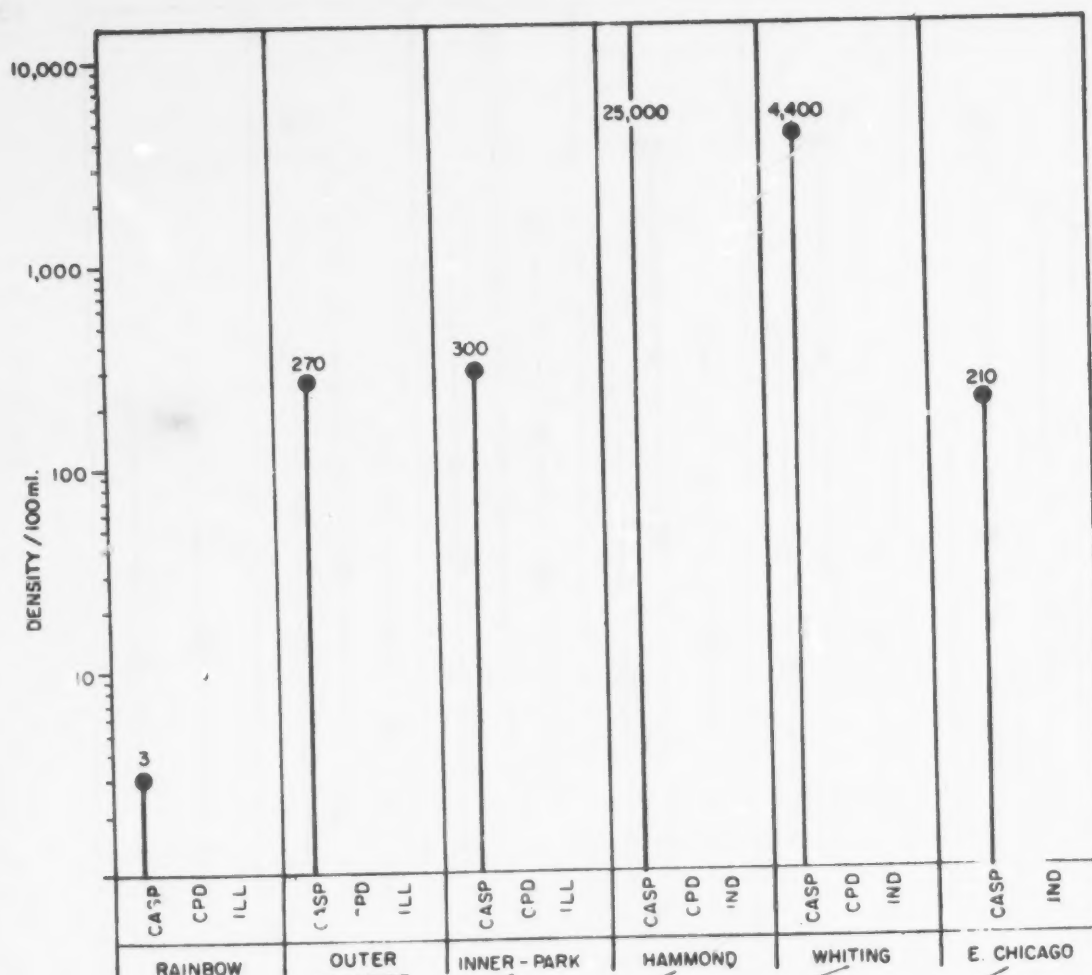
(16) No. of Times Sampled

CALUMET AREA SURVEILLANCE PROJECT

BEACH SAMPLING - FECAL STREPTOCOCCI

MAXIMUM, MINIMUM, MEAN & MEDIAN
 JUNE - SEPT. 1965

U S DEPT OF HEALTH, EDUCATION & WELFARE
 REGION V CHICAGO, ILLINOIS



CASP Calumet Area Surveillance Project
 CPD Chicago Park District
 ILL. State Sanitary Board
 IND. State Sanitary Board
 Direction of Flow *

CALUMET AREA SURVEILLANCE PROJECT

BEACH SAMPLING
 MEAN FECAL COLIFORM
 JUNE - SEPT. 1965

U.S. DEPT. OF HEALTH, EDUCATION & WELFARE
 REGION V CHICAGO, ILLINOIS

TABLE V-2

Percent of Beach Samples over 1000 Coliform per 100 Milliliter
and Total Number of Samples Collected - 1965 Season

COLLECTING AGENCY	BEACH									
	Rainbow		Calumet Park ~~INNER~~				Hammond		Whiting	
	Total		Outer		~~Hammond~~		Total		Total	
	%	No.	%	No.	%	No.	%	No.	%	No.
CASP	50%	14	69%	16	63%	16	94%	16	81%	16
Chicago Park Dist.	65%	23	54%	43	60%	43	61%	18	61%	18
Illinois	46%	13	61%	13	77%	13				
Indiana							100%	16	62%	16
									31%	16

The above table shows that based on the criteria recommended by the conferees the beaches in the Calumet Area were unsuitable for bathing from 31% to 100% of the days when samples were taken. Since these samples were taken according to an established schedule on various days of the week without reference to weather or other conditions, it can be assumed that the time the bacterial quality of the water at the beaches exceeded the 1000 coliform per 100 ml level would be fairly close to the above percentages.

The Calumet Area Technical Committee has recommended the following criteria for determining satisfactory water quality for bathing at the beaches in the Calumet Area:

Bacteria - Number per 100 ml by MF Techniques (Tentative)

- a) The number of bacteria shall be the Arithmetic Average of the last five consecutive sample results.
- b) Satisfactory area if MF Coliform are less than 1000 and MF Fecal Streptococci are less than 100.
- c) Satisfactory area if MF Coliforms are from 1000 to 5000 and MF Fecal Streptococci are less than 20.
- d) A single sample result of over 100,000 Coliforms shall require immediate investigation as to the cause. Items to be considered in the judgment of cause and action to be taken include the sanitary survey, winds, currents and weather conditions.

These standards have been applied to information collected at the six beaches in the Calumet Area for the 1965 swimming season. The criteria was first applied to the individual data collected by the Calumet Area Surveillance Project and the States of Illinois and Indiana. The criteria specifies the membrane filter method of processing the sample. In the first analysis the data received from the Chicago Park District was not used since the MPN method was used as their regular method of processing samples. The data from the three agencies represented weekly samples. Therefore, the five-sample average covers a five-week period. At the beginning of the season the data was averaged until five samples were available.

A second analysis was made on some of the beaches using data from all four agencies assembled in chronological order so that at the most, the five samples would represent the water quality over a five to eight day period. Since this second analysis included MPN counts, the criteria is somewhat modified. However, MPN counts are usually slightly higher than similar counts by the MF method.

Calumet Area Surveillance Project began their sampling on June 9, the State of Indiana on May 24, the State of Illinois on June 30, and the Chicago Park District on June 1. September 15 was used as the end of the swimming season for this review.

TABLE V-3

Number of Days and Percent of Time Water Quality at Beaches did Not Meet Proposed Calumet Area Technical Committee Criteria for Beaches in 1965 Season (June 1 to September 15, 1965 - 107 days).

COLLECTING
AGENCY

BEACH

	Rainbow		Calumet Park				Hammond		Whiting		E.Chicago	
	Days	%	Outer Days	%	Inner Days	%	Days	%	Days	%	Days	%
CASP	79	74	61	57	97	91	107	100	64	60	65	61
ILLINOIS	57	53	65	61	78	73						
INDIANA							77	72	21	20	0	0
ALL DATA COMBINED	38	35	41	38	74	69	84	79	73	68	42	39
REMARKS			1 sample over 100,000		1 sample over 100,000		2 samples over 100,000					

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The total coliform densities at these beaches are shown graphically in Figure V-1. Rainbow and E. Chicago beaches are the only beaches where the median values for each agency are close to or below 1000 per 100 ml. It should be noted, however, that the average total coliform values at Rainbow Beach are over twice the recommended 1000 per 100 ml level. This results from some of the high total coliform values being many times the median value. The responsible State agency found total coliform counts of 100,000 or over, and 300,000 for two Calumet beaches and the Hammond Beach respectively for 100 ml of sample. The maximum values as shown in Figure V-1 indicates that the Calumet, Hammond and Whiting beaches are subject to periods of extremely heavy pollution.

Fecal streptococci are also an indication of possible contamination of the water from domestic sewage. It is usually considered as an indicator of recent pollution since the fecal streptococci which are present in fecal matter of warm-blooded animals, have a more rapid die-off rate than the total coliform group. All beaches except E. Chicago had maximum counts of 1000 or over per 100 ml indicating that these beaches are subject to contamination from domestic wastes. However, most of the median values are within a reasonable level.

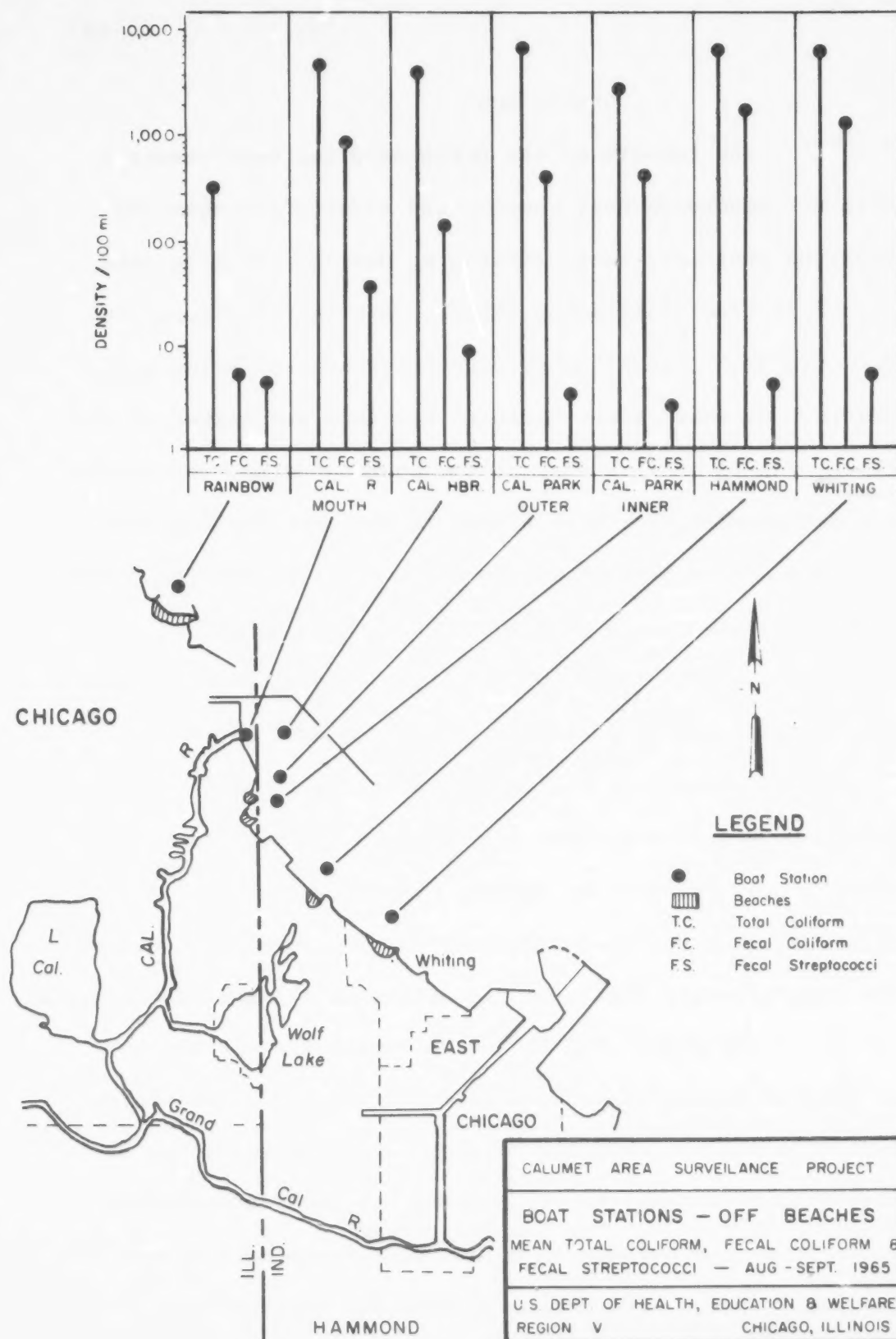
Samples were collected by boat on August 31 and

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September 7 to determine whether bacteriological concentrations varied with the distance from shore. The boat samples were taken about a quarter mile off shore opposite the regular beach wade-in sampling points -- just a few hours after collecting the corresponding beach sample. E. Chicago beach was not sampled by boat because of weather conditions and its great distance from the other beaches.

A comparison of the average coliform, fecal coliform, and fecal Streptococci counts obtained from these two boat runs are given in Figure V-4.

(Figure V-4 follows:)



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The results of the beach sampling were compared with corresponding boat samples and information obtained from the municipal water intakes at Hammond, Whiting, and Chicago's South Filtration Plant. This latter information was obtained through the Chicago Department of Water and Sewers. In most cases the total coliform was higher at the beach wade-in station than at the corresponding boat station. The two samples that were higher at the boat station were over four times as high as the beach station, but the corresponding fecal Streptococci counts were much higher at the beach stations in these two instances. Fecal Streptococci counts were also generally the same or higher at the beach wade-in stations than at the boat stations. The two exceptions had values less than ten and were not significantly greater than the wade-in values. The average coliform and fecal Streptococci values reported at the municipal intakes are significantly less than the values obtained at the beaches.

The results of the beach sampling program were studied to determine sources of pollution and under what condition the wastes from these sources jeopardize the bacteriological quality of the water at the beaches. The location of the beaches in relation to waste sources and the geography of the area greatly affect the quality of water found at the beaches.

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The Calumet Park Inner and Outer, Hammond, and Whiting beaches are located within an artificial bay. This bay is formed by Calumet Harbor breakwall on the north and the Indiana Harbor land fills and breakwall on the south. Within this artificial bay there are five major sources of bacteriological pollution. Two of these are combined sewer overflows. One of these serves a portion of the Whiting area and discharges to Lake Michigan just south of the Whiting Beach. The second serves the Robertsdale section of Hammond and discharges south of Hammond's beach. The outfall of the American Maize Products Company is also located in the vicinity of the Robertsdale outfall. The Indiana Harbor Canal discharges its grossly polluted waters through Indiana Harbor into this bay area. Also the Calumet River under flood conditions or extremely low lake levels reverses its flow and partially discharges to Calumet Harbor.

Rainbow beach by its location north of the bay and its orientation in a northeasterly direction appears to be protected from most of the pollution emanating within the artificial bay area. However, under certain conditions pollution can make this beach unsafe for swimming based on the criteria recommended by the conferees.

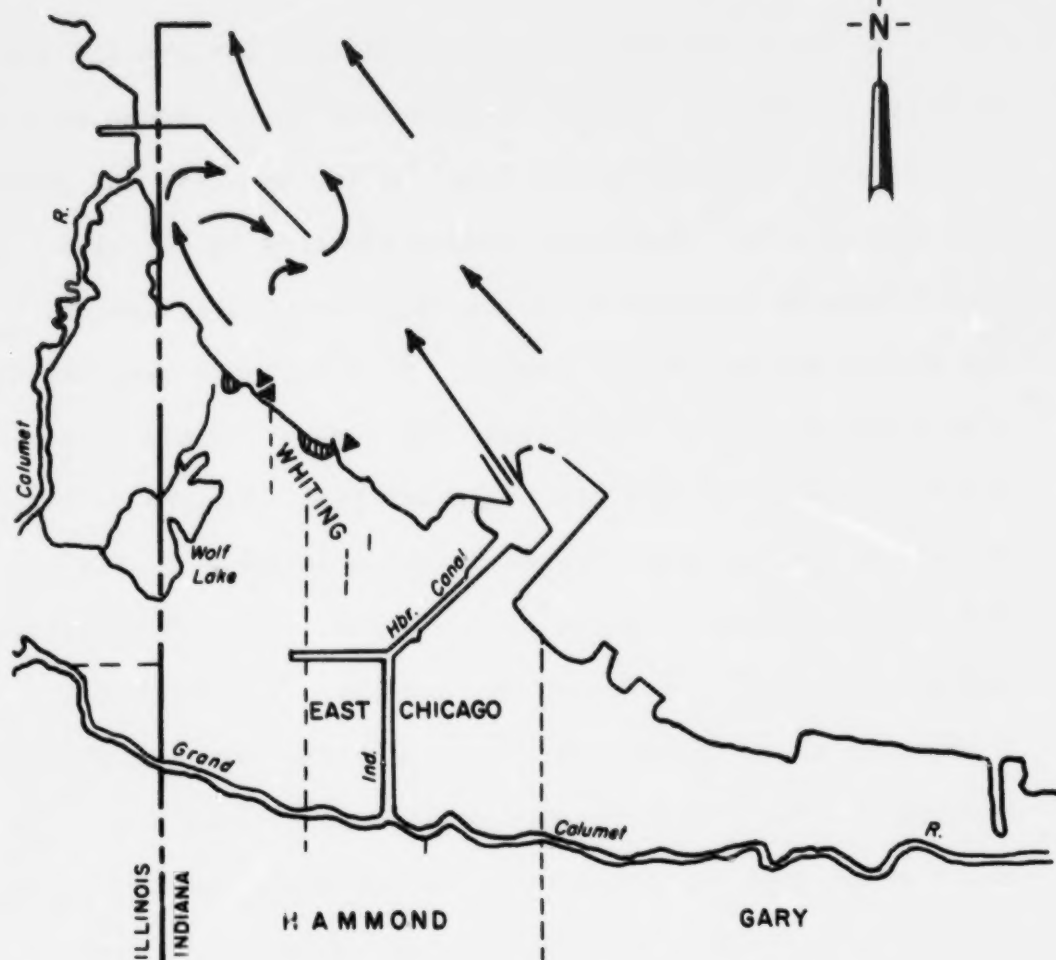
E. Chicago's beach is located just south of the landfill at Indiana Harbor. This location tends to protect

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the beach from pollution from Indiana Harbor. However, this beach is subject to pollution discharged to Lake Michigan along the shore south and southeast of this beach.

Lake current studies by the GLIRB Project indicate that the prevailing currents in this sector of Lake Michigan, under normal summer conditions, are parallel to shore and in a northwesterly direction. These currents are shown in Figure V-5.

(Figure V-5 follows:)



- LEGEND**
- ← DIRECTION OF FLOW
 - ▲ POLLUTION SOURCES
 - ▨ BEACH AREAS

CALUMET AREA SURVEILLANCE PROJECT

**WATER MOVEMENT IN THE
CALUMET HARBOR AREA**

U.S. DEPT. OF HEALTH, EDUCATION & WELFARE
REGION V CHICAGO, ILLINOIS

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There appears to be a correlation between the higher total coliform and fecal Streptococci counts found at the beaches with rainfall in the area and the velocity and direction of the wind. Bacterial counts appeared to increase with rainfall, although when the rain lasted over one day the counts started to drop again. This may have been due to a flushing action in the streams and sewers. Winds of over ten miles per hour from the north and east appeared to alter the normal summer lake current patterns as shown in Figure V-5. This appears to cause pollution, which would normally bypass the beaches, to be pushed shoreward. Under these conditions of turbulence more debris, algae and fish are also carried shoreward and bottom deposits are stirred up. This would cause some of the increase in bacterial counts at the beaches. As further evidence of this change in currents, popcorn slag was found floating at the beaches when northerly winds of over ten miles an hour were experienced. As a corollary to this, bacterial counts were lower with the normal summer breeze from the southwest.

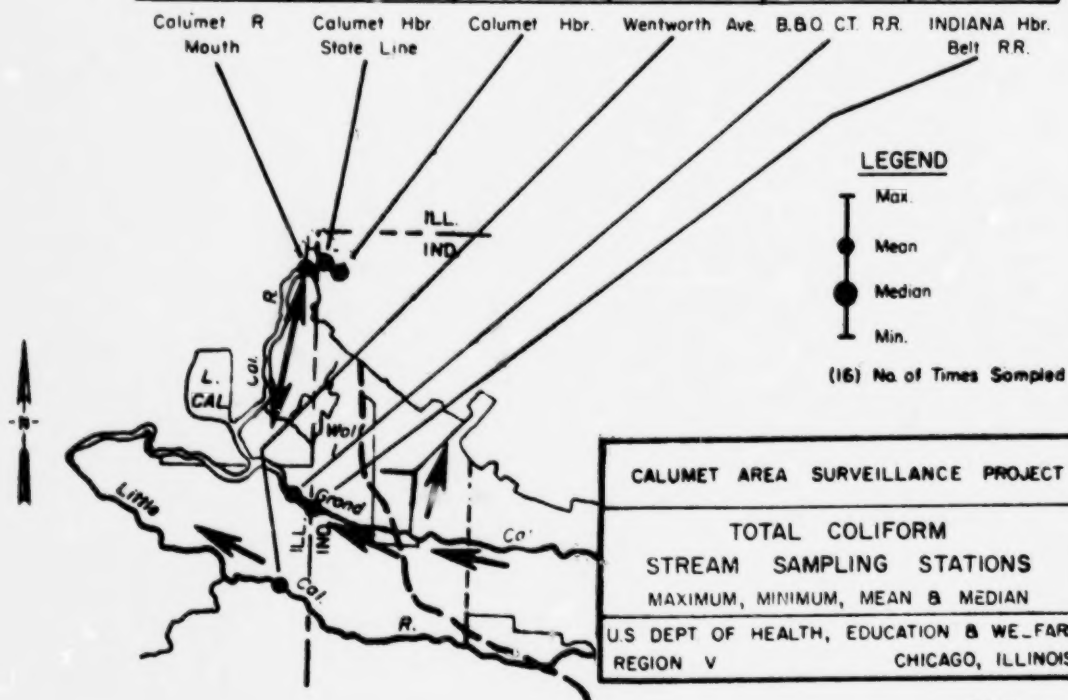
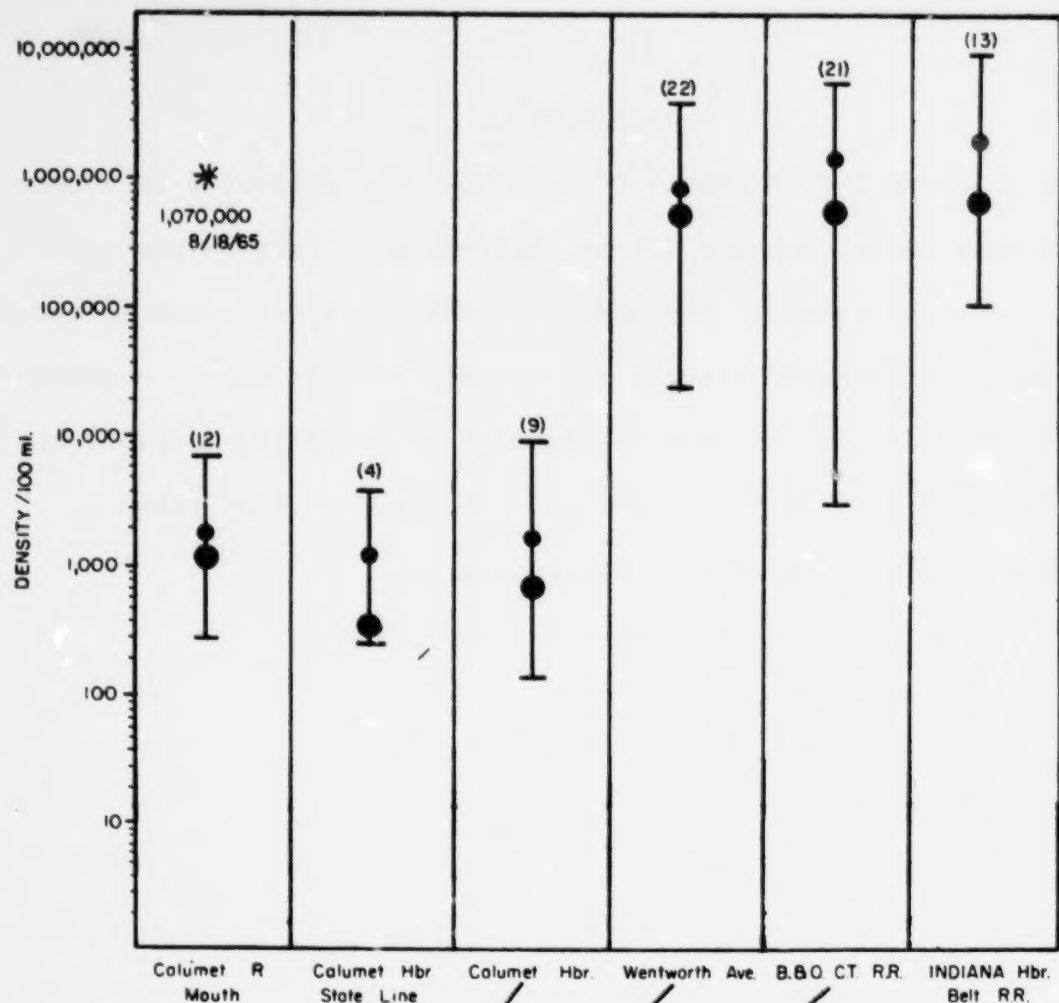
Stream and Harbor Sampling

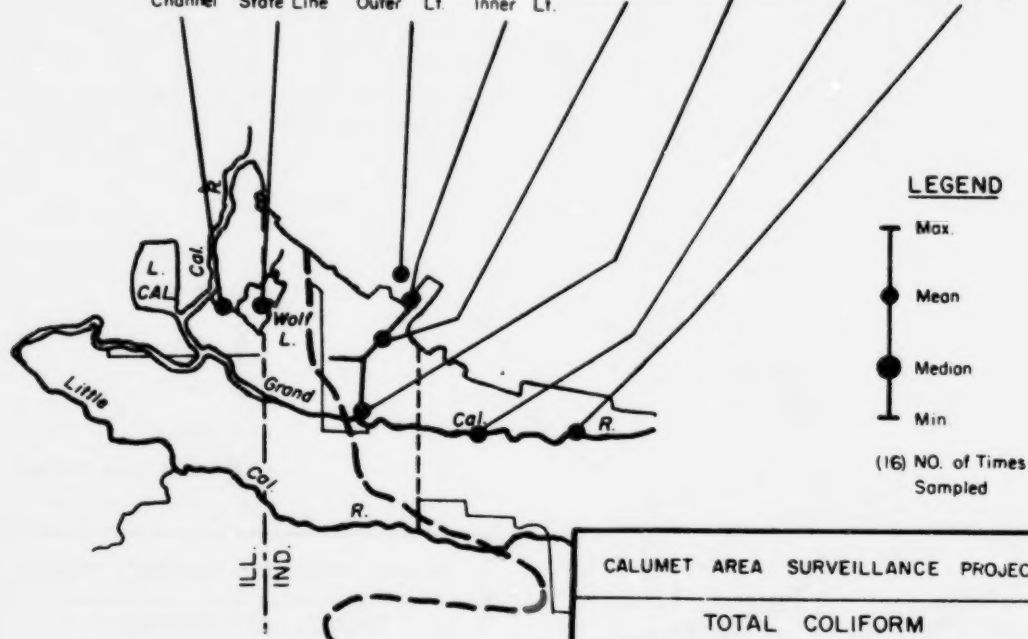
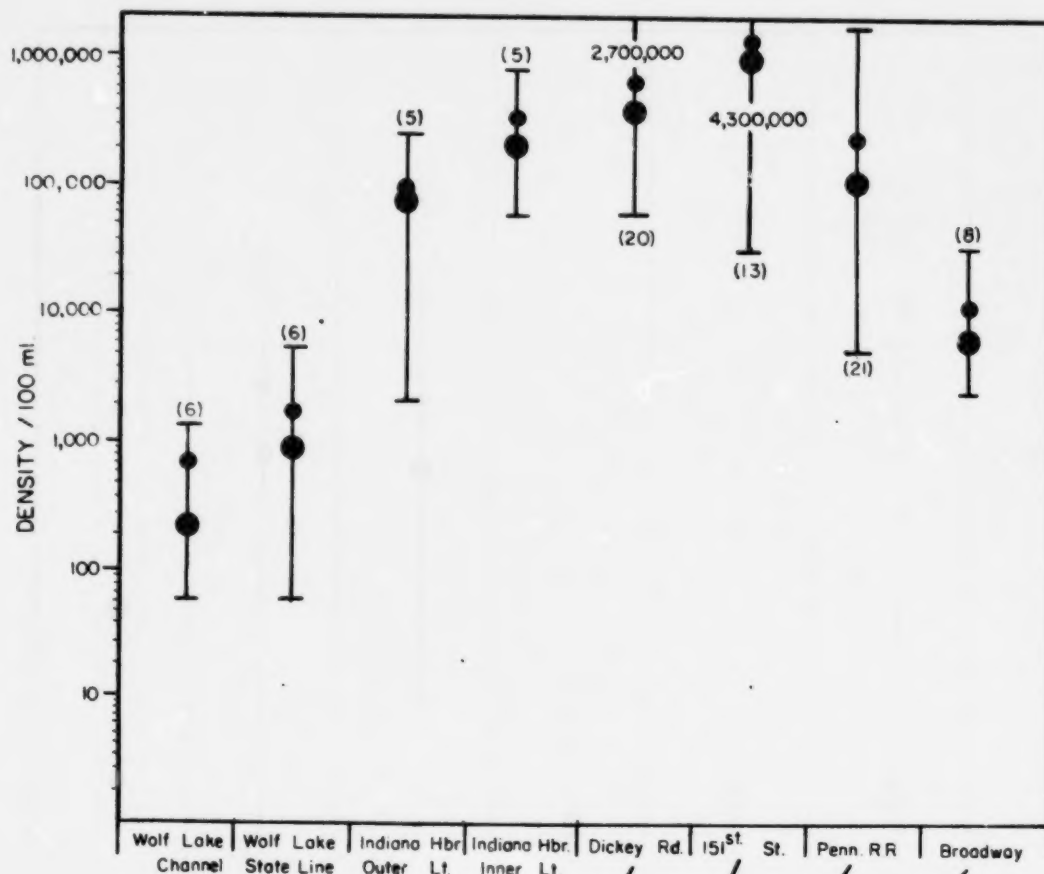
Fourteen stream or harbor stations were sampled for total coliform and fecal Streptococci during the study period. The maximum, minimum, arithmetic mean, and median values per 100 milliliters for these two parameters are given

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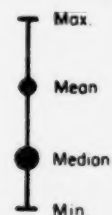
in Figures V-6 through V-9. Samples were collected on a once-a-week basis, but not all 14 stations were sampled for the full study period. The number of samples represented in the data presented in Figures V-6 through V-11 is given in parenthesis. Fecal coliform counts made at 13 of the stations are shown in Figures V-10 and V-11. The samples were taken in the middle of the stream at mid-depth.

(Figures V-6 through V-11 follow:)





LEGEND

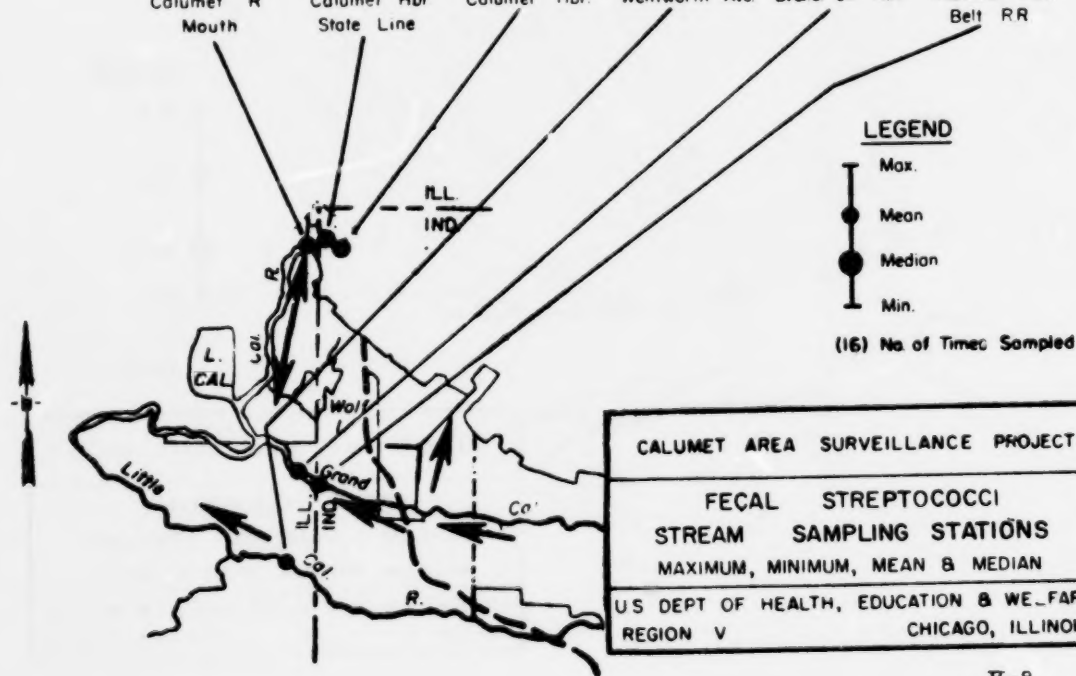
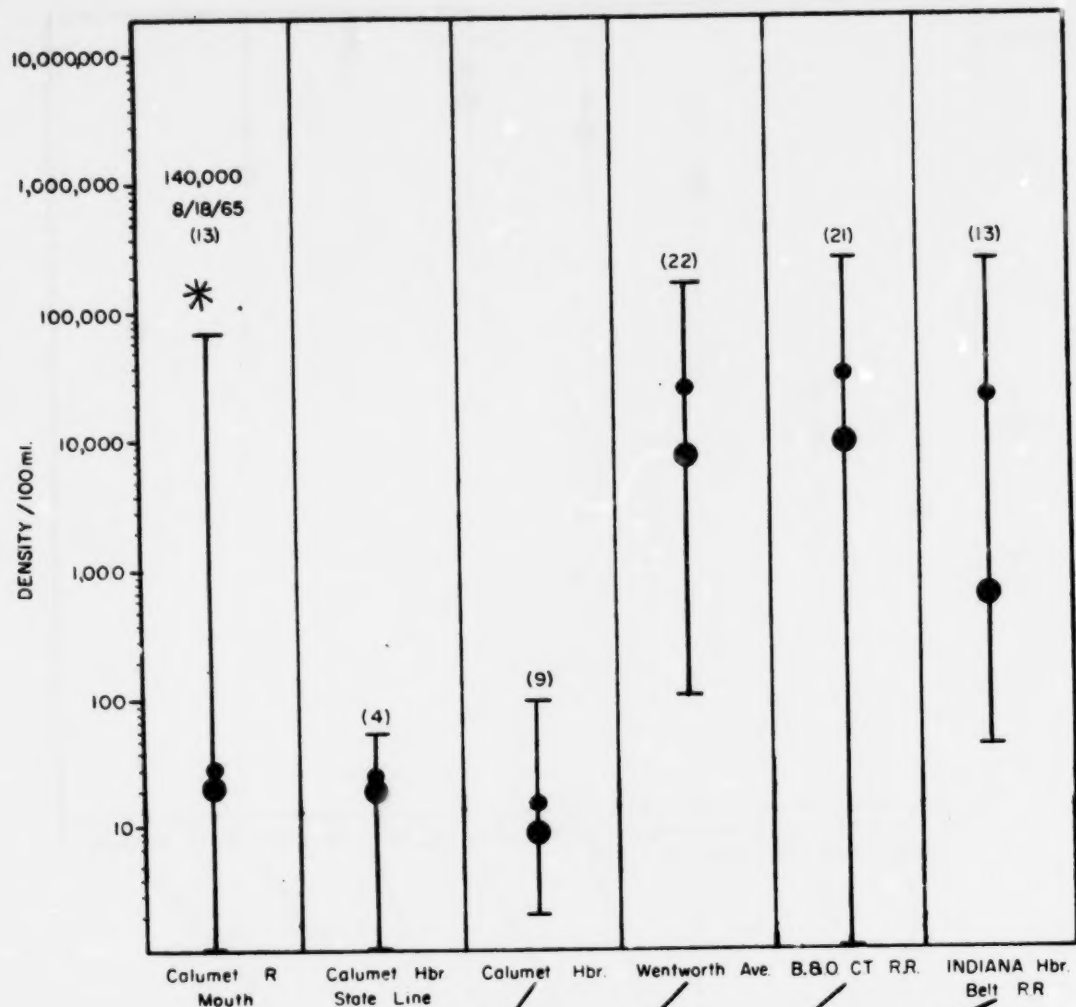


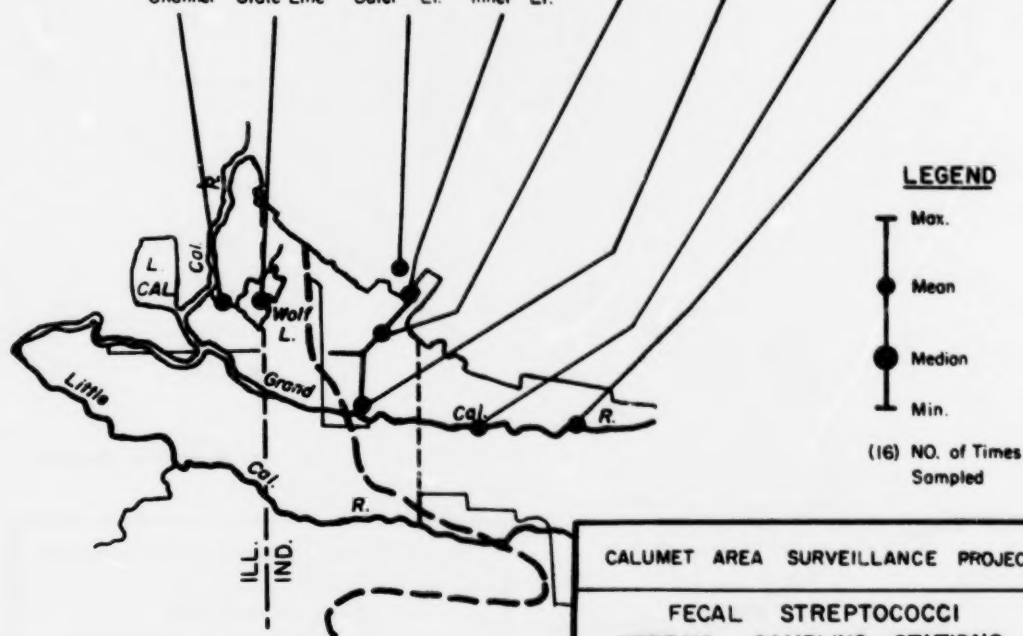
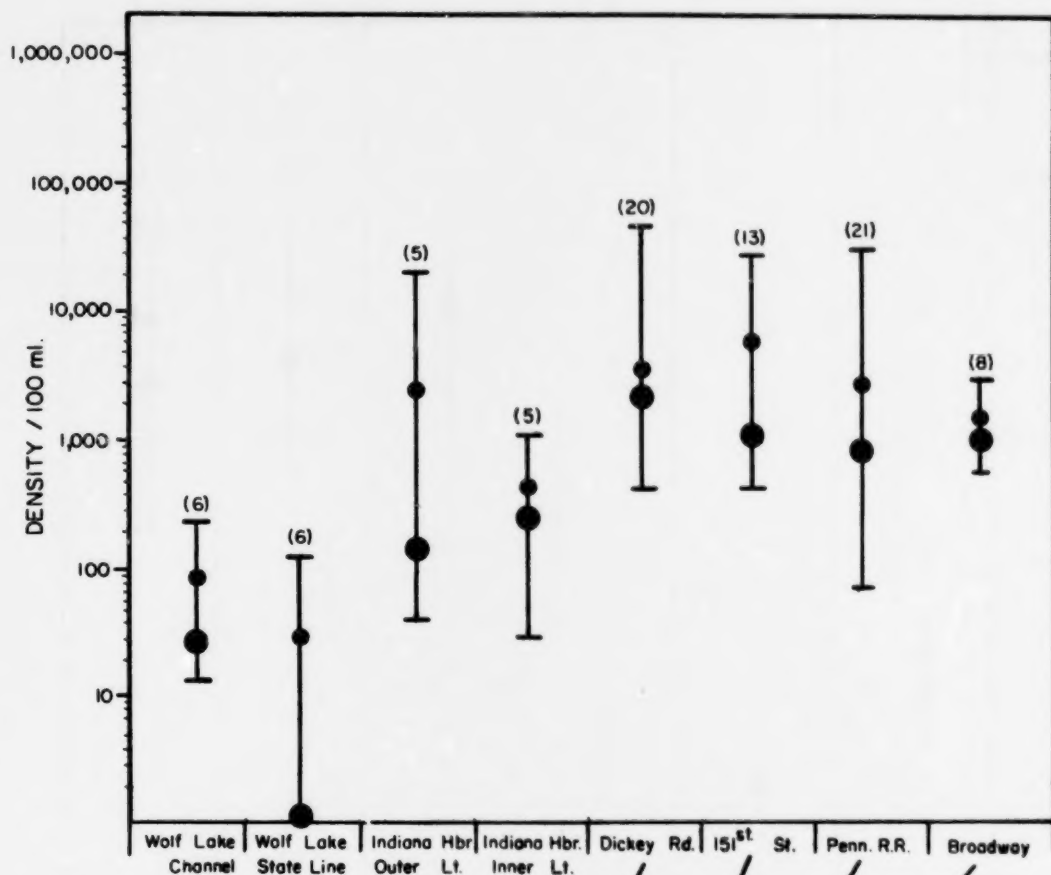
(16) NO. of Times
Sampled

CALUMET AREA SURVEILLANCE PROJECT

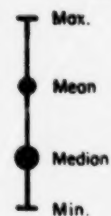
TOTAL COLIFORM
STREAM SAMPLING STATIONS
MAXIMUM, MINIMUM, MEAN & MEDIAN

U.S. DEPT. OF HEALTH, EDUCATION & WELFARE
REGION V CHICAGO, ILLINOIS





LEGEND

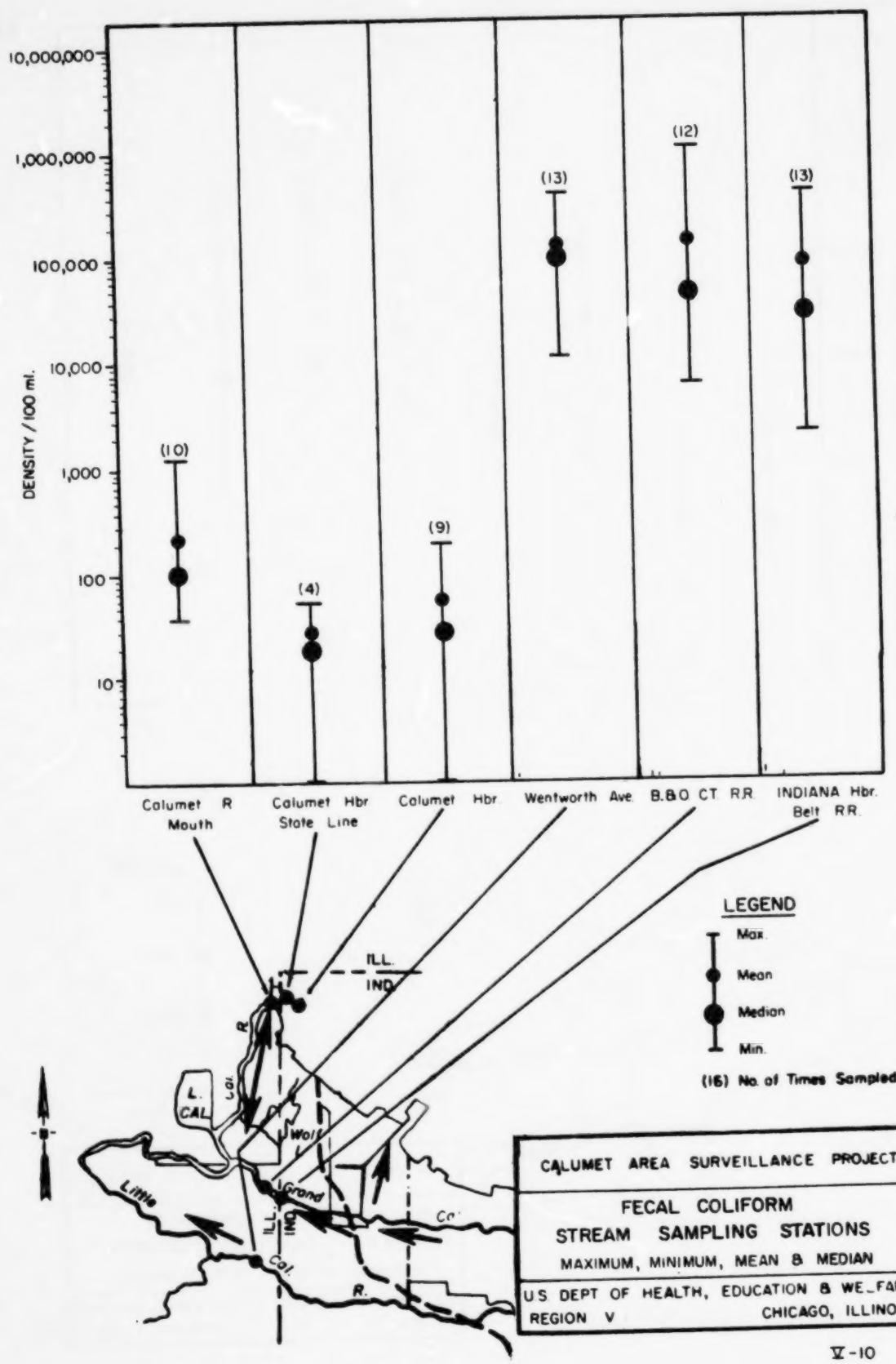


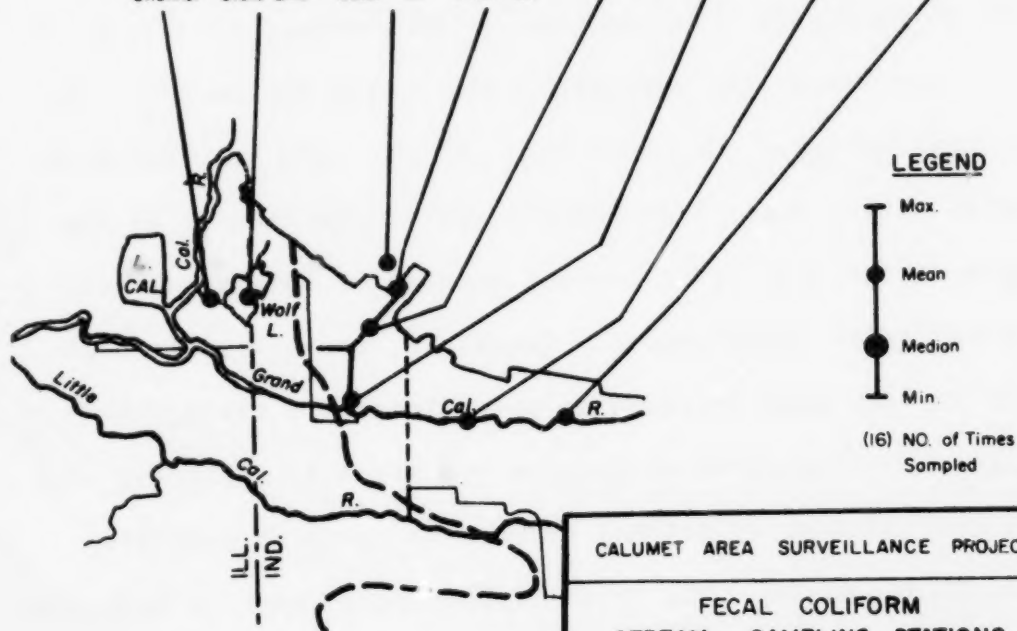
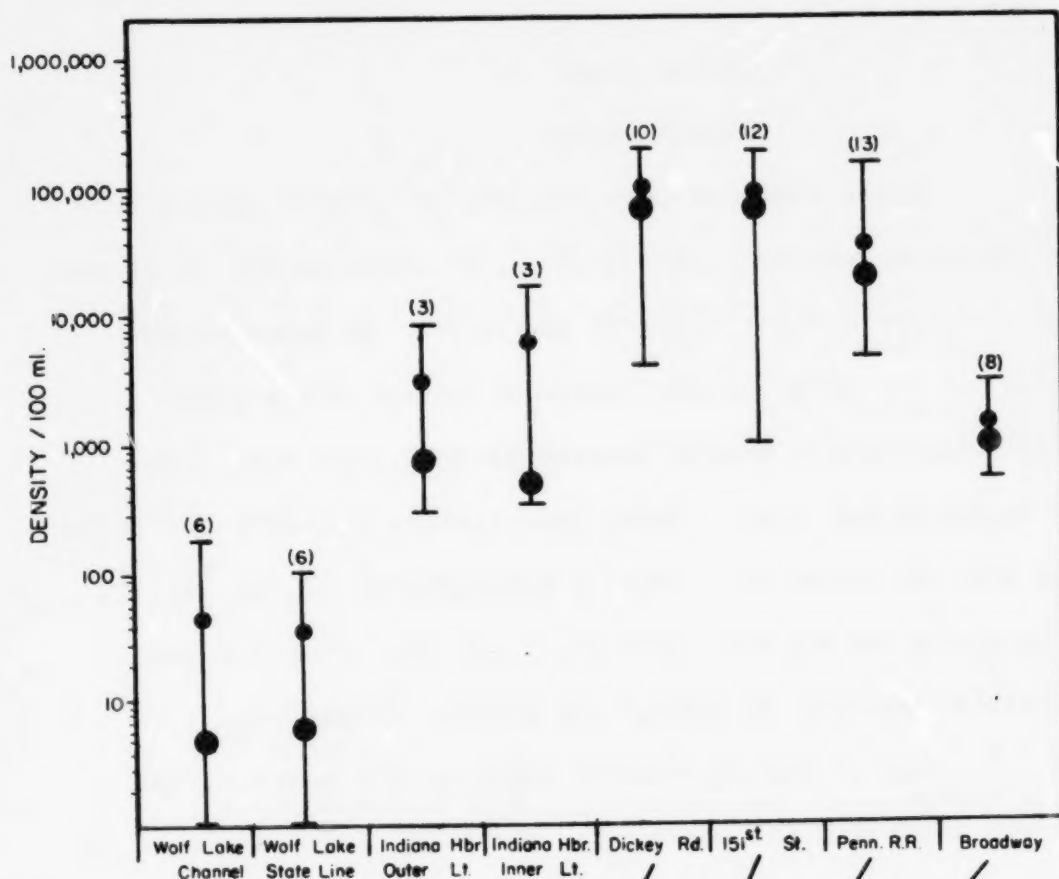
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CALUMET AREA SURVEILLANCE PROJECT

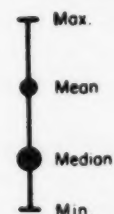
FECAL STREPTOCOCCI
STREAM SAMPLING STATIONS
MAXIMUM, MINIMUM, MEAN & MEDIAN

U.S. DEPT. OF HEALTH, EDUCATION & WELFARE
REGION V CHICAGO, ILLINOIS





LEGEND



(16) NO. of Times
Sampled

CALUMET AREA SURVEILLANCE PROJECT

FECAL COLIFORM
STREAM SAMPLING STATIONS
MAXIMUM, MINIMUM, MEAN & MEDIAN

U.S. DEPT. OF HEALTH, EDUCATION & WELFARE
REGION V CHICAGO, ILLINOIS

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Calumet Harbor

Three stations were sampled in Calumet Harbor during the study period. The location of stations are 1) at the center of the Calumet River at its mouth, 2) opposite the center of the river at the Illinois-Indiana State Line, 3) the Mid-Channel Harbor Station is 3500 feet east from the mouth of the river. This last station replaces the State-line station since it is more representative of the quality of water in the harbor. All three are boat stations and therefore sampling is subject to weather conditions.

One of the 13 samples taken at the mouth of the Calumet River was extremely high for both total coliform and fecal Streptococci. At the time of this sample on August 18 a boat had passed the sampling point, which may possibly be the cause of these extremely high values. The corresponding samples at the State line taken within a few minutes of the sample at the mouth gave average counts for both total coliform and fecal Streptococci. Therefore, the extremely high value has not been included in determining the average or median values as shown on Figures V-6 and V-8. Instead, they are shown as individual crosses in their appropriate place on the scale. The fecal Streptococci count of over one-tenth the total coliform count indicates that the pollution was of recent origin and probably a result of the passing

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vessel. This points up the need for control of wastes from this source.

The O'Brien locks are now in operation and the lake levels are slightly higher this year over the 1964 season. Therefore, the majority of the pollution found in the Calumet Harbor and at the mouth of the river could be expected to originate in the immediate area. The total coliform are lowest at the State line station while the fecal Streptococci counts are lowest at the Harbor station. In August and September of 1963 the results of 20 samples in Calumet Harbor gave maximum total coliform and fecal Streptococci counts of 350 and 250 respectively, and median values of 67 and 2. It should be noted that these are much lower than the 1965 values.

Little Calumet River at Wentworth Avenue

The Wentworth Avenue station was established to monitor the wastes in the Little Calumet River flowing from Indiana to Illinois. The nearest station available for historical data is across the State line at Hohman Avenue. The maximum values obtained for 22 samples for both total coliform and fecal Streptococci are comparable to the maximum value obtained from 20 samples by the GLIRB Project in August and September of 1963. However, the average values for total coliform have been reduced from 1,600,000 to 800,000

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and the minimum value from 130,000 to 20,000. The average value for fecal Streptococci dropped from 80,000 to 6,300 while the minimum fecal count dropped from 19,000 to less than 100. These values are still above the 5,000 for total coliform and 500 for fecal Streptococci recommended by the Calumet Area Technical Committee except for periods of storm overflow. The reduction in bacteriological densities is probably due to the treatment of a part of the domestic wastes of the communities of Highland and Griffith by the Hammond sewage treatment plant.

Grand Calumet River at Indiana Harbor Belt Railroad

The Indiana Harbor Belt Railroad bridge crosses the Grand Calumet River downstream from the Illinois-Indiana State Line. This sampling station records the level of pollution crossing the State line. Hohman Avenue, about one-half mile further upstream in Indiana is the closest station for historic data. Thirteen samples collected by the Surveillance Project at this station yielded a maximum total coliform value of 8,900,000, an average value of 2,000,000, a mean value of 640,000 and a minimum value of 100,000. Fecal coliform values as obtained from 13 samples were also extremely high, ranging from 410,000 to 2,000 with an average value of 78,000 and a mean of 28,000. Fecal Streptococci

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values are slightly lower. These range from 250,000 down to 40 with an average of 21,000 and a mean of 560. The above data shows that gross pollution is still crossing the State line in the Grand Calumet River. The total coliform and fecal Streptococci counts show no improvement over conditions found by the GLIRB Project in 1963 when 19 samples were processed.

Grand Calumet River at Baltimore and Ohio
Chicago Terminal Railroad Bridge

Twenty-one samples were collected at this railroad bridge, which is about 3,000 feet further downstream on the Grand Calumet from the Indiana Harbor Belt RR bridge. This railroad bridge was sampled in place of the Harbor Belt Railroad bridge when the sampling program was initiated. Sampling at this station was discontinued in November in favor of the Indiana Harbor Belt Railroad bridge which is closer to the State line. Total coliform values at this station ranged from 5,600,000 to 3,000. The average value was 1,400,000 and the median value was 540,000. These values are a little less than the corresponding values found 3,000 feet upstream. Fecal Streptococci values ranged from 260,000 to less than 1 (one) with an average value of 35,000 and a mean of 8,000. It should be noted that although the maximum values are about the same at both stations, the average and median values are a little greater than found just upstream.

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However, of 12 fecal coliform samples, the maximum, minimum, average and median values at this station were about double those found at the Indiana Harbor Railroad bridge. The area adjacent to the stream between these two bridges is an industrial area.

Grand Calumet River at Broadway Avenue

The Grand Calumet river at Broadway Avenue in Gary was one of the initial stations sampled by the Project. This station is near the headwaters of the Grand Calumet River and the flow consists mainly of industrial wastes discharged by the U. S. Steel Company, Gary Works. Since the Steel Company has additional outfalls downstream from this point and their dredge operated on both sides of this station, sampling at this station was discontinued after eight weeks in favor of sampling at 151st Street and the Indiana Harbor Canal. The eight samples collected show evidence of sanitary wastes. Total coliform values ranged from 2,700 to 36,000 with an average of 10,000 and a median of 6,200. Fecal Streptococci values ranged from 540 to 3300 with an average of 1500 and a median of 950.

Grand Calumet River at Pennsylvania Railroad Bridge

This station is located just upstream of the Gary Sewage Treatment Plant where the wastewater flow from U. S.

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Steel still forms almost the entire stream flow. Compared with the Broadway station the total coliform counts have increased with a maximum value of 1,900,000 and a minimum value of 5,300. The average of 21 samples was 254,000 and the median 104,000. Fecal Streptococci ranged from 70 to 29,000 with an average of 2,734 and a median of 800. Thirteen fecal coliform samples had counts that varied from 4800 to 160,000. The average was 37,000 and the median 19,000. These values are not much lower than the GLIRB project found with 19 samples in 1963 at Industrial Highway, which is below the outfall of the Gary Sewage Treatment Plant. The Grand Calumet River is grossly polluted by sanitary wastes even before it receives the wastes from any municipal sewage treatment plant.

Indiana Harbor Canal at 151st Street

This sampling station was added the latter part of August, to obtain information on the quality of water after the two sections of the Grand Calumet have joined together to form the Indiana Harbor Canal. This station is below the outfalls of the Gary, Hammond and E. Chicago Sewage Treatment Plants. E. Chicago is the only one of these three municipal sewage treatment plants which, at present, chlorinates its effluent. The total coliform counts at this station ranged from 33,000 to 4,300,000 with an average value of 1,500,000

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and a median value of 1,000,000. Fecal Streptococci counts varied from 400 to 28,000 with an average of 5,000 and a median of 1,000. Fecal coliform counts averaged 80,000 but varied from 1,000 to 190,000. The median value was 68,000. Twenty total coliform samples by the GLIRB Project at this location in 1963 varied between 19,000 and 2,500,000 with an average value of 380,000. Eighteen fecal Streptococci samples averaged 5,400 but varied from 100 to 40,000. Comparable total coliform values are now double the values found in the summer of 1963, although fecal Streptococci counts are about the same.

Indiana Harbor Canal at Dickey Road

Dickey Road is the last highway crossing the Indiana Harbor Canal before it discharges to Lake Michigan. The dry weather flow at this station is estimated to be about 800 cubic feet per second (cfs). Twenty samples at this station gave total coliform counts ranging from 57,000 to 2,700,000 with an average value of 680,000 and a median value of 330,000. Fecal Streptococci counts for these samples varied from 7,800 to 14,000 with an average of 3,300 and a median of 2,100. Ten fecal coliform samples had counts that varied from 4,200 to 190,000 with an average count of 84,000. The median value was 69,000. Indiana Water Quality Data for this station for the period from January,

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1963 to April, 1965 show total coliform counts as high as 25,000,000 and a minimum value of 24,000. The average value was 3,500,000 and the median value was 200,000. The bacterial quality of the water in the canal at this station shows gross pollution. Although few pleasure boats use this canal, this is a busy channel for commercial shipping and tugs. Handling of lines that have fallen in this water or spray from the tugs' bow wave can form a health hazard to the men involved.

Indiana Harbor Canal - Inner Light (Mouth of Canal)

This sampling station is located at the mouth of the Indiana Harbor Canal just prior to the turning basins. This is a boat station and weather conditions have at times prevented sampling at the two stations in Indiana Harbor. Total coliform counts for five samples varied from 830,000 to 57,000 with an average value of 240,000 and a median value of 110,000. Fecal Streptococci values varied from 30 to 1,000 with an average value of 430 and a median value of 250. Three total coliform samples had values of 340, 450, and 17,000.

Indiana Harbor - Outer Light (East Breakwall Inner Light, as given on Navigation Charts.)

This station is located just downstream of the

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turning basins and about 2,500 feet upstream from where the canal discharges into Lake Michigan at the end of the break-wall. The average dry weather flow at this station is estimated to be about 2300 cfs which is about three times the dry weather flow at Dickey Road. Five total coliform samples at this station varied from 2,000 to 270,000 with an average value of 94,000 and a median value of 87,000. Fecal Streptococci counts varied from 40 to 11,000 for an average of 2,400 and a median value of 140. Three fecal coliform samples had counts of 290, 760 and 8,600. Since these samples were taken when Lake Michigan was fairly calm the reduction in bacteriological counts from those found at Dickey Road are probably due mainly to the dilution resulting from the increased flow and possible toxic effect of the industrial waste flows originating between the two points. Even so, this represents a gross amount of bacterial pollution which is being discharged into Lake Michigan in the vicinity of municipal water intakes and bathing beaches. The water in the turning basins is usually yellow from pickle liquor wastes, which has a high sulfuric acid content.

Wolf Lake at Indiana-Illinois
State Line

Sampling at this station was initiated in the middle of October. There is a causeway dividing Wolf Lake

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at the State line with several culverts to allow drainage from the Indiana side to flow through to the Illinois side then out to the Calumet River and down the Illinois waterway. Six samples collected at the outlet of the culvert, representing the quality of the water that has flowed across the State line, had a total coliform count ranging from 60 to 5,400 with an average value of 1,700 and a median value of 930. Fecal Streptococci counts for these samples varied from less than one to 120 with an average of 33 and a median value of less than one. Fecal coliform counts varied from less than one to 100 with an average of 36 and a median value of 6. This lake is used extensively for recreation in the form of swimming, boating, water skiing and fishing. Although these samples were taken after the normal recreation season, the water appears to be of satisfactory bacteriological quality.

Wolf Lake Channel

This sampling station is located on Wolf Lake outlet about 3,000 feet downstream from Wolf Lake. The six samples obtained at this station since mid-October had total coliform counts that varied from 60 to 1,600 with an average value of 700 and a median value of 250. Fecal Streptococci counts varied from 15 to 220 with an average of 90 and a median value of 30. Fecal coliform counts varied from less than one to 190 with an average of 47 and a median value of

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five. These counts are a little higher than the counts at the State line. This could be partly due to surface runoff entering the ditch below the outlet of Wolf Lake.

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VI. CHEMICAL WATER QUALITY

Introduction

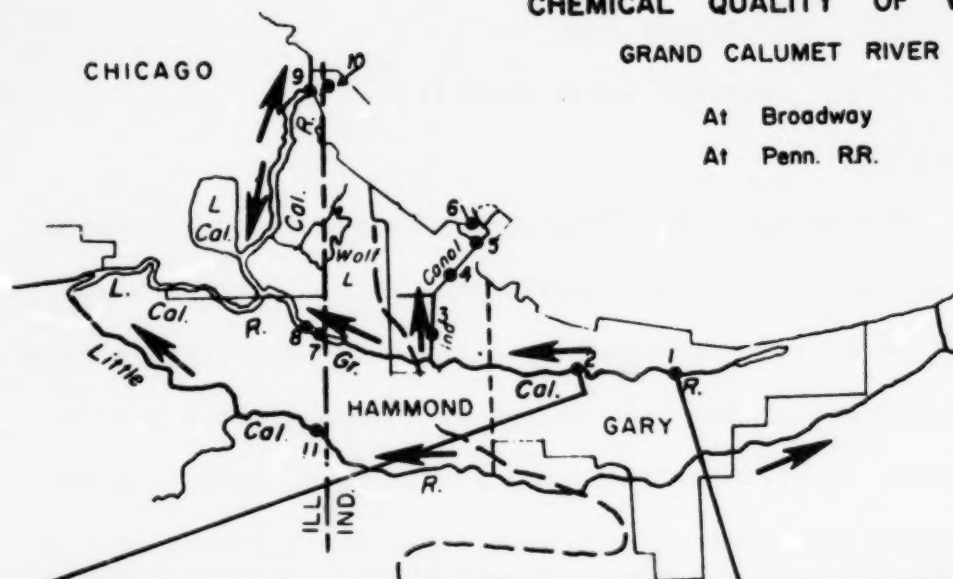
Stream and harbor stations were sampled for chemical analysis in addition to bacteriological data. Samples were collected on a once-a-week basis at the midpoint of the stream and at mid-depth or ten feet in the case of navigable waters. Samples were immediately preserved and/or iced where required in accordance with procedures established in "Standard Methods for Examination of Water and Wastewater, 1960." Laboratory analysis on samples subject to deterioration was initiated on the same day they were collected.

The location of the sampling station and results of the chemical analysis is presented in Tables VI-1 to VI-6. This data covers the period from June 24 to October 26, 1965. The river mileage from the mouth of the Illinois River is given for each station so that the distance in miles between stations can be determined. Also the number of samples analyzed is given in parenthesis after the name of the station. Variations from this number for specified parameters are noted at the bottom of the table.

(Tables V-1 through V-6 follow:)

CHEMICAL QUALITY OF WATER

GRAND CALUMET RIVER

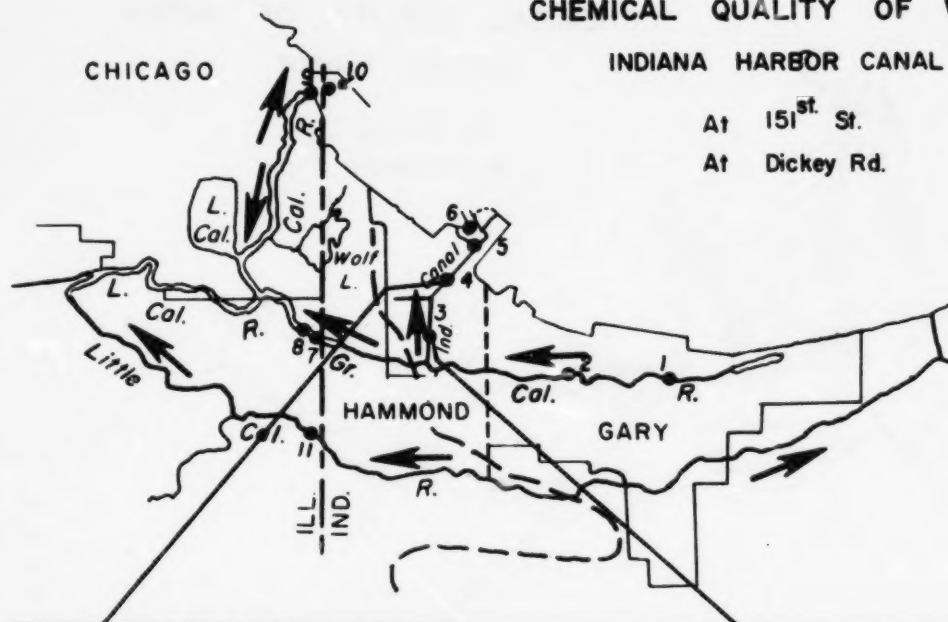


2. Grand Calumet R. at Penn. R.R. Bridge -GC 336.4(19)*						1. Grand Calumet R. at Broadway -GC 339.6(10)*			
Parameter		Max	Min	Mean	Median	Max	Min	Mean	Median
pH		7.2	6.5	6.7	6.9	7.6	7.0	7.3	7.3
DO	mg./L	6.0	1.1	3.6	3.7	4.3	1.6	3.3	3.4
BOD	"	17	5.7	9.8	8.5	8.1	3.7	5.8	4.9
COD	"	59	7.9	32	39	145	25	62	46
Sulfates	"	186	29	56	49	40	24	30	30
NH ₃ - N	"	3.7	0.87	1.5	1.6	2.5	1.4	2.1	2.2
NO ₃ - N	"	7.5	0.32	1.4	0.69	0.88	0.20	0.53	0.48
Org.- N	"	7.3	0.06	1.3	1.6	3.0	0.47	2.3	2.6
Tot. PO ₄	"	0.93	0.10	0.28	0.24	0.34	0.12	0.21	0.20
Tot. Sol. PO ₄	"	0.32	0.00	0.08	0.06	0.11	0.04	0.06	0.05
Total Iron	"	23	2.7	7.9	6.6	38	3.8	15	7.1
Phenol	ug/L	100	0	28	22	331	146	207	195
Cyanide	mg/L	0.19	0.00	0.03	0.01	0.30	0.09	0.19	0.17
Sus. Solids	"	70	26	44	39	--	--	--	--
Dis. Solids	"	365	170	245	235	--	--	--	--

* Number denotes river mileage point from river mouth. Number in parenthesis denotes the number of samples for each parameter with these exceptions:
 17 Cyanide samples 9 dis. Solids 7 Cyanide samples
 10 Suspended Solids

CHEMICAL QUALITY OF WATER

INDIANA HARBOR CANAL

At 151st St.

At Dickey Rd.

4. Indiana Harbor Canal at Dickey Road IHC 334.6 (19)*						3. Indiana Harbor Canal at 151st St. IH 331.9 (9)*			
Parameter		Max	Min	Mean	Median	Max	Min	Mean	Median
pH		7.3	6.3	7.0	7.0	7.3	6.7	7.0	7.1
DO	mgs./L	2.9	0.0	0.3	0.0	5.0	2.1	3.6	3.8
BOD	"	11	3.5	6.3	5.5	12	4.4	7.9	7.3
COD	"	48	0.0	23	20	65	7.7	29	14
Sulfates	"	77	46	65	66	71	50	56	56
NH ₃ -N	"	3.1	1.1	2.3	2.4	4.0	0.77	1.8	2.3
NO ₃ -N	"	3.5	0.31	1.1	1.1	2.2	0.23	1.2	1.1
Org.-N	"	3.8	0.08	1.9	2.1	4.3	0.30	1.5	1.3
Tot. PO ₄	"	0.91	0.24	0.57	0.53	4.6	0.52	1.3	0.81
Tot. Sol. PO ₄	"	0.57	0.01	0.26	0.29	0.64	0.19	0.49	0.48
Total Iron	"	3.8	0.88	2.4	2.2	5.7	0.78	2.4	1.6
Phenol	ug/L	42	1	20	20	41	9	19	15
Cyanide	mg/L	0.00	0.00	0.00	0.00	0.17	0.00	0.03	0.00
Sus. Solids	"	23	6	14	12	59	16	30	27
Dis. Solids	"	340	240	260	300	640	240	315	280

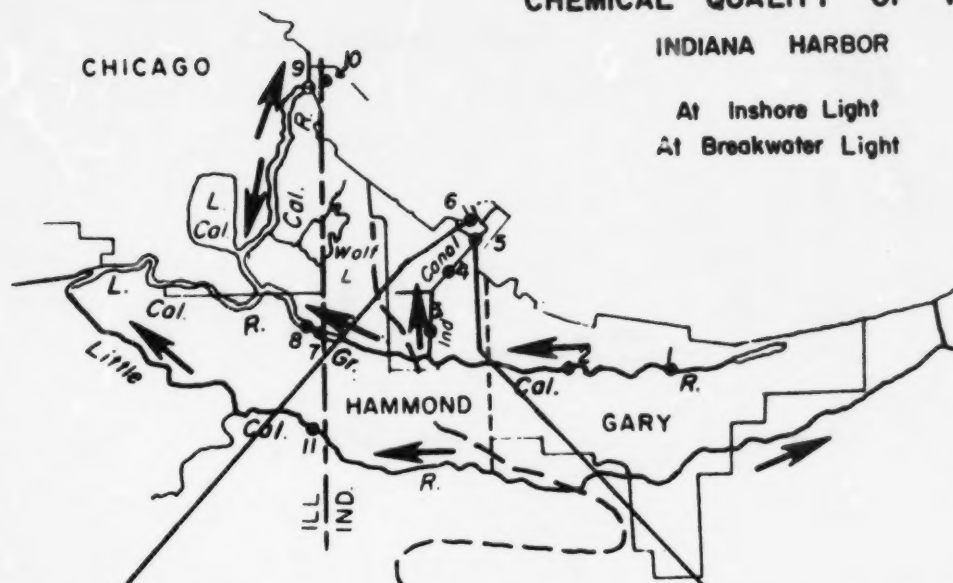
* Number denotes river mileage point from river mouth. Number in parenthesis denotes the number of times parameters were sampled with these exceptions:
 18 Cyanide 10 Sus. Solids
 9 Dis. Solids

CHEMICAL QUALITY OF WATER

INDIANA HARBOR

At Inshore Light

At Breakwater Light



6. Indiana Harbor at Harbor Light (Breakwater) IHC 336.2(6)*					5. Indiana Harbor at Hrbr. Light (Inshore) IHC 335.7(6)*			
Parameter	Max	Min	Mean	Median	Max	Min	Mean	Median
pH	7.3	6.9	7.1	7.1	7.3	6.9	7.1	7.1
DO	mg/L 6.1	1.9	4.2	4.2	5.9	2.4	3.4	2.4
BOD	" 13	2.3	4.5	3.0	9.1	2.8	4.8	3.7
COD	" 67	8.4	20	8.6	67	0.0	20	9.3
Sulfates	" 54	32	45	50	62	34	51	54
NH ₃ - N	" 1.4	0.38	0.89	0.73	1.4	0.75	1.1	1.1
NO ₃ - N	" 0.59	0.26	0.42	0.44	0.74	0.29	0.42	--
Org.- N	" 1.4	0.10	0.73	0.71	1.7	0.30	1.1	1.3
Tot. PO ₄	" 0.21	0.06	0.14	0.15	0.23	0.08	0.16	0.15
Tot. Sol. PO ₄	" 0.12	0.03	0.07	0.07	0.10	0.03	0.06	0.06
Total Iron	" 3.0	1.3	1.9	1.7	5.0	2.1	3.1	2.6
Phenol	mg/L 7	0	4	3	21	6	12	9
Cyanide	mg/L 0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Sus. Solids	" 13	3	5	5.0	105	10	36	13
Dis. Solids	" 255	230	175	235	255	215	240	250

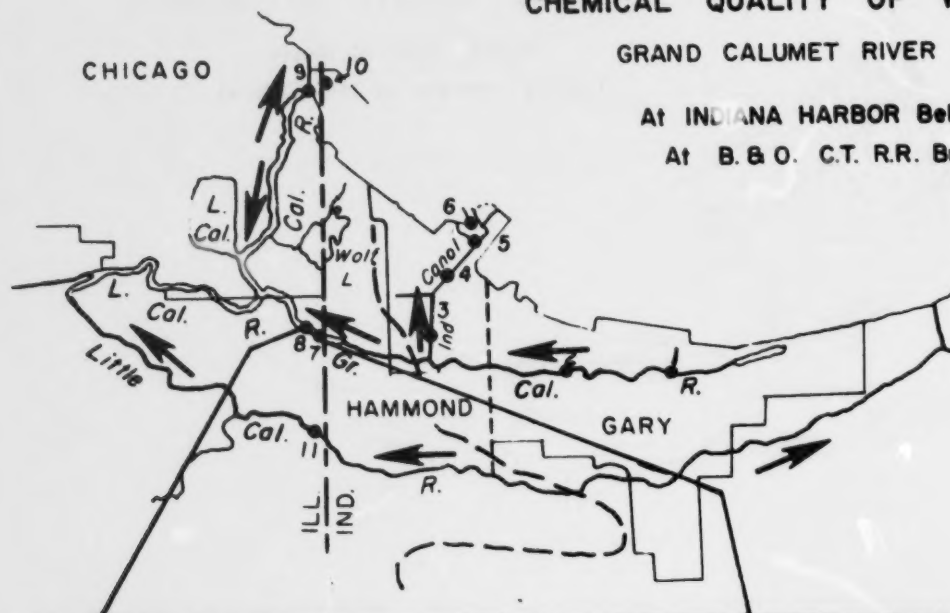
* Number denotes river milage point from river mouth. Number in parenthesis denotes the number of times parameters were sampled with these exceptions:
 4 Sus. Solids 3 Dis. Solids 4 Sus. Solids 3 Dis. Solids

CHEMICAL QUALITY OF WATER

GRAND CALUMET RIVER

At INDIANA HARBOR Belt R.R.

At B. & O. C.T. R.R. Br.

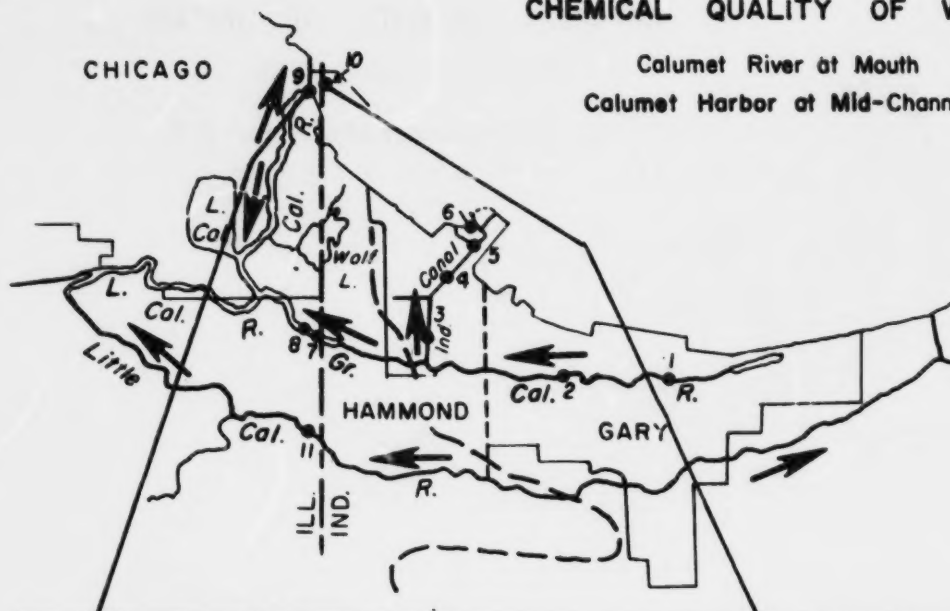


8. Grand Calumet R. at B & OCT RR Bridge GC 328.0(19)*						7. Grand Calumet R. at Indiana Hrbr. Belt RR Br. GC 328.5(9)*			
Parameter		Max	Min	Mean	Median	Max	Min	Mean	Median
pH		7.2	3.7	6.6	6.9	7.2	6.5	7.0	7.0
DO	mgs./L	8.9	0.0	3.2	2.3	5.4	0.0	2.7	2.7
BOD	"	25	3.9	13	12	20	4.6	11	7.3
COD	"	113	18	56	53	108	16	47	26
Sulfates	"	233	80	165	168	282	52	179	179
NH ₃ - N	"	14	0.93	6.7	5.7	7.8	1.2	2.9	2.4
NO ₃ - N	"	17	0.45	5.4	4.2	13	1.2	5.3	4.6
Org.- N	"	16	0.19	6.0	5.2	3.7	0.05	0.90	1.8
Tot. PO ₄	"	40	2.7	13	11	12	5.4	7.7	6.9
Tot. Sol. PO ₄	"	31	1.7	9.5	6.9	9.2	1.3	5.3	5.5
Total Iron	"	6.6	0.76	3.2	2.1	17	0.27	2.8	0.82
Phenol	ug/L	38	0	14	10	46	4	18	16
Cyanide	mg/L	0.12	0.00	0.01	0.00	0.12	0.00	0.02	0.00
Sus. Solids	"	83	8	29	22	155	7	38	20
Dis. Solids	"	760	325	600	695	705	58	480	540

* Number denotes river mileage point from river mouth. Number in parenthesis denotes number of times parameters were sampled with these exceptions:
 10 Sus. Solids 9 Dis. Solids

CHEMICAL QUALITY OF WATER

Calumet River at Mouth
Calumet Harbor at Mid-Channel



9. Calumet River
at Mouth -CR 333.4 (11)*

10. Calumet Harbor, State Line
& Mid-Channel CR 334.0(10)*

Parameter	Max	Min	Mean	Median	Max	Min	Mean	Median
pH	8.0	7.8	7.9	7.9	8.0	7.7	7.9	7.9
DO	mgs./L 9.4	7.1	8.1	8.1	10	7.0	8.5	8.3
BOD	" 3.7	1.0	1.8	1.5	2.1	1.0	1.5	1.6
COD	" 74	0.9	17	8.9	26	0.0	9.0	5.9
Sulfates	" 26	19	24	24	37	19	25	24
NH ₃ - N	" 0.39	0.16	0.24	0.22	0.27	0.10	0.19	0.20
NO ₃ - N	" 0.41	0.17	0.28	0.28	0.53	0.17	0.27	0.23
Org.- N	" 0.60	0.04	0.27	0.29	0.51	0.03	0.26	0.26
Tot. PO ₄	" 0.25	0.02	0.12	0.80	0.78	0.02	0.15	0.06
Tot. Sol. PO ₄	" 0.23	0.02	0.08	0.05	0.29	0.02	0.08	0.04
Total Iron	" 2.3	0.23	0.98	0.72	1.8	0.09	0.52	0.18
Phenol	mg/L 8	0	2	1	3	0	1	0
Cyanide	mg/L 0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Sus. Solids	" 76	2	22	18	17	1	8	6
Dis. Solids	" 280	160	195	185	195	155	175	170

* Number shows river mileage point from river mouth. Number in parenthesis denotes number of times parameters were sampled with these exceptions:

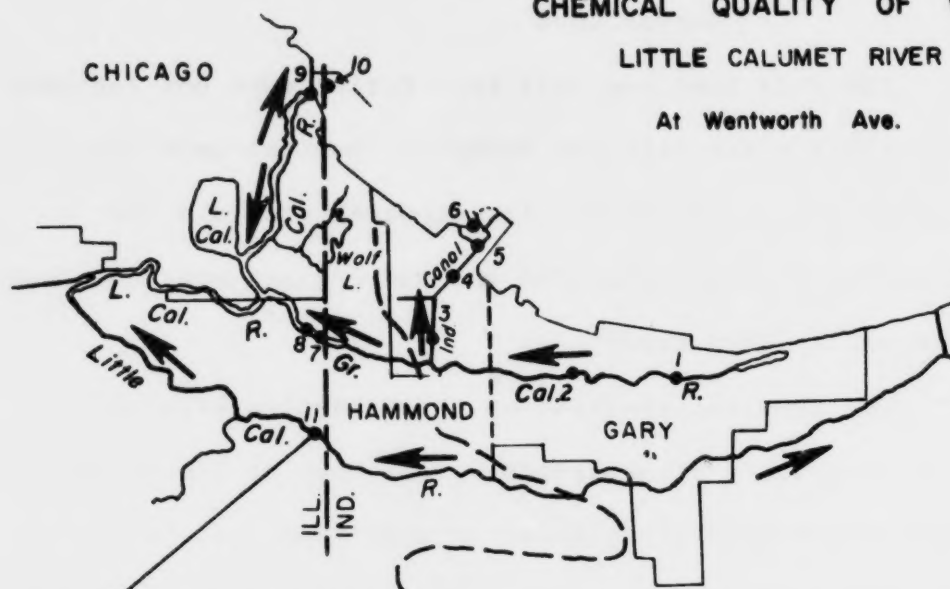
8 Sus. Solids 7 Dis. Solids

7 Sus. Solids 6 Dis. Solids

CHEMICAL QUALITY OF WATER

LITTLE CALUMET RIVER

At Wentworth Ave.



11. Little Calumet R.
at Wentworth Av. LC 332.2(19)*

Parameter		Max	Min	Mean	Median
pH		8.8	7.1	7.4	7.3
DO	mgs./L	5.0	0.0	1.8	1.5
BOD	"	35	3.9	13	10
COD	"	79	5.9	45	51
Sulfates	"	310	57	172	170
NH ₃ -N	"	3.7	0.42	2.1	2.1
NO ₃ -N	"	4.4	0.04	1.3	0.72
Org.-N	"	8.6	0.13	3.2	2.8
Tot. PO ₄	"	14	1.5	5.3	4.5
Tot. Sol. PO ₄	"	9.7	0.51	3.4	3.6
Total Iron	"	3.8	0.45	1.5	1.2
Phenol	ug/L	38	0	8	6
Cyanide	mg/L	0.12	0.00	0.01	0.00
Sus. Solids	"	705	17	175	41
Dis. Solids	"	640	110	470	505

* Number denotes river mileage point from river mouth. Number in parenthesis denotes number of times parameters were sampled with these exceptions:

17 Cyanide 10 Sus. Solids

10 Dis. Solids

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The Wolf Lake and Wolf Lake Outlet were not included in these tables since only two weeks of chemical data was available at the cutoff date. The chemical analysis for Calumet Harbor at the State Line and Mid-Channel stations have been combined in this report.

The chemical analysis on these samples were performed in accordance with methods agreed upon at the Calumet Area Enforcement-Laboratory Director's Meeting. At this meeting, held on April 29, 1965, the six laboratory conferees discussed the methods to be used by all laboratories concerned with the Calumet Area Surveillance Activities.

Stream and Harbor Sampling

Grand Calumet River at Broadway Avenue GC 339.6

This station was sampled for chemical analysis for ten weeks before it was abandoned in favor of a station of Indiana Harbor Canal at 151st Street. The closest station that the GLIRB Project sampled in 1963 was at Virginia Street about four-tenths of a mile further upstream. Comparing the results of 20 samples obtained in August and September of 1963 with the results obtained in 1965, values for pH, Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Nitrate nitrogen remained about the same.

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Grand Calumet River at Pennsylvania R.R. Bridge GC336.4

The closest station for historical data is four-tenths of a mile downstream from the Pennsylvania Railroad bridge at Industrial Highway, but in this four-tenths of a mile the Gary Municipal Sewage Treatment Plant discharges its effluent after secondary treatment. Therefore, this municipal waste discharge has to be taken into account in comparing chemical analysis. The nineteen samples taken in 1965 have about the same range of values as the 20 samples taken a little further downstream by the GLIRB Project in 1963 for DO and phosphates; BOD, COD, pH and Ammonia Nitrogen values are a little lower at the upstream station while Nitrate nitrogen and dissolved solids were much higher in 1965 than corresponding 1963 values.

Indiana Harbor at 151st Street IH 331.9

This sampling station was added in the latter part of August, so there are only nine weeks of sampling information available for 1965. The GLIRB Project obtained 20 samples at this station during August and September, 1963. Comparing the two sets of data it is noted that the phosphates have nearly doubled. In 1963 the average value of 20 samples was 0.61 mg/l. 1965 sampling shows the average value has increased to 1.3 mg/l. The new maximum phosphate

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value also doubled at this station since the 1963 sampling. Dissolved solids have also increased substantially since the GLIRBP sampling. However, the BOD and COD have been reduced with a corresponding increase in the DO since 1963. Also, phenols show a substantial reduction, particularly with respect to the maximum value which is now only one-tenth the 1963 value. Ammonia nitrogen and the pH have declined slightly and the nitrate nitrogen has increased slightly with the increased availability of oxygen in the stream. The suspended solids remained about the same.

Indiana Harbor Canal at
Dickey Road IHC 334.6

Indiana Harbor Canal at Dickey Road was not included in the 1963 sampling program for the GLIRB Project. Therefore the data is compared with the data at 151st Street, two and a half miles upstream. At Dickey Road the dry weather flow has increased an estimated 50 cfs over the flow at 151st Street. This additional flow consists of industrial wastes. It should be noted that the DO has dropped to zero for over 50 per cent of the time. The BOD has remained about the same, but the COD is lower than obtained by the previous sampling at 151st Street. Phosphates and iron show a reduction as do suspended and dissolved solids but phenols remain unchanged between the two stations.

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Indiana Harbor at Harbor Light
(Inshore) IHC 335.7

This sampling station is located at the mouth of the Indiana Harbor Canal just upstream of the turring basins at Inland and Youngstown Steel Companies. This is a boat station and could only be sampled under favorable weather conditions. Our 20-foot boat was moored at the Calumet Coast Guard Station and rough water in Lake Michigan often prevented sampling at this station. Therefore, the results of only six sampling periods in 1965 are available. In July and September of 1963, the GLIRE Project conducted two extensive sampling cruises in this area of Lake Michigan. Comparing ten DO samples taken on these two cruises with 1965 sampling indicates that the dissolved oxygen present in the stream has increased. The average DO increased from 2.5 mg/l in 1963 to 3.4 mg/l in 1965. The average value for phenols showed a reduction from 26 ug/l in 1963 for 17 samples to 12 ug/l for the six samples in 1965. However, the average sulfates increased slightly from 42 mg/l in 1963 to 51 mg/l in 1965. The ammonia nitrogen and pH values have remained about constant with a slight drop in the dissolved solids value.

Indiana Harbor at Harbor Light
(Breakwater) IHC 336.2

This station is located in the center of the channel opposite the East Breakwall inner light where the water

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quality monitor is located. As noted in the bacteriological section of this report, the average dry weather flow at this station is about 2300 cfs, and except when strong north winds persist and push lake water back up the channel, the quality of water measured at this station represents the level of pollution being discharged to Lake Michigan. The collection of samples for full chemical analysis at this station will be continued for comparison with the output of the monitoring station.

Weather conditions prevented sampling of this station, particularly during the fall months, so that only six samples were collected in 1965. The results of the sampling in July and September of 1963 by the GLIRB Project would indicate that there has been a slight increase in the dissolved oxygen content of the water in the harbor. The ten samples in 1963 varied from 0.4 to 2.6 mg/l with an average of 1.6 mg/l, while the average for six samples in 1965 was 4.2 mg/l with no values as low as the 1963 average value. Phenols also show an improvement. Seventeen values for samples collected in 1963 ranged from 2 to 127 $\mu\text{g/l}$ with an average value of 43 $\mu\text{g/l}$. In 1965 the highest value recorded was 7 $\mu\text{g/l}$ with an average value of 4 $\mu\text{g/l}$. The dissolved solids and ammonia nitrogen also show some reduction in value over the past two years. The pH has shown just a slight

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increase and the sulfates remained about the same. In general the changes in water quality at the two Indiana Harbor stations, based on the results of the 1963 and 1965 sampling periods, tend to agree with each other and to show an improvement for phenols and dissolved oxygen. However, the six samples obtained in 1965 are not a sufficient base on which to form rigid conclusions.

Grand Calumet River at Indiana Harbor Belt
Railroad Bridge GC 328.5

In 1963 the GLIRB Project sampled the Grand Calumet River at Hohman Avenue during August and September. This station is two-tenths of a mile upstream and across the State line in Indiana from the Indiana Harbor Belt Railroad Bridge. During the early sampling period in 1965 the Grand Calumet River was sampled at the B&O C.T. Railroad Bridge. Therefore, data from only nine samples are available for present water quality. However, the B&O C.T. Railroad Bridge is only five-tenths of a mile further downstream and 19 samples were collected at that station. Although the dissolved oxygen values show a general increase since the 1963 sampling, the DO still went down to zero for at least one sample and the average value is still low. The average BOD and COD for the 20 samples in 1963 and the nine samples in 1965 are about the same, but the maximum value for COD in 1965 was

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substantially higher than in 1963. Suspended solids have decreased somewhat but the average for dissolved solids has increased. Ammonia nitrogen and nitrate nitrogen have increased substantially since the previous sampling period. The average phosphate value increased from 6.2 mg/l in 1963 to 7.7 mg/l in 1965.

Grand Calumet River at B&O C.T.
Railroad Bridge GC 328.0

Nineteen weekly samples were collected at this station before it was discontinued in favor of the Indiana Harbor Belt Railroad Bridge station just upstream and closer to the State line. The Hohman Avenue station is the closest point on which historical data is available. This section of the Grand Calumet River is quite industrialized. The median value of dissolved oxygen for the 19 samples collected in 1965 was 2.3 mg/l, which, although still quite low, is above the maximum value obtained from 20 samples in 1963. It should be noted, however, that three of the 20 samples showed a zero DO and two others had a DO of less than 1.0 mg/l. The average BOD was about the same, but the COD was a little higher in 1965, as compared to 1963. Ammonia nitrogen and the nitrate nitrogen content of the water have both increased since the 1963 sampling period. The average value of ammonia nitrogen increased from 3.4 mg/l in 1963 to 6.7 mg/l

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in 1965 and the nitrate nitrogen from 1.2 mg/l to 5.4 mg/l during the same period. Phosphates increased from an average value of 6.2 mg/l in 1963 to 13 mg/l in 1965. Suspended and dissolved solids values remained about the same for both sampling periods.

Calumet River at Mouth CR 333.4

This station, located at the mouth of the Calumet River, is a boat station. Therefore, sampling is subject to weather conditions and only 11 samples were obtained during the 1965 study period. Since the O'Brien locks have been put into operation and the lake levels have increased slightly over their 1964 low, the flow in the Calumet River is generally away from Lake Michigan. However, the U. S. Steel Company, South Works, has industrial waste discharges into Calumet Harbor, the slip at the north end of the harbor, and into the Calumet River itself. Dr. Kaplovsky, of the Metropolitan Sanitary District of Greater Chicago, stated at one of the meetings of the Calumet Area Technical Committee that the Sanitary District planned on passing about 200 to 250 cfs through the O'Brien locks. These locks are located about six and one-half miles downstream from the sampling station. Therefore the drainage from the area, including Wolf Lake, and other industrial waste flows are included in this 200 cfs. Therefore, at times there would be little, if any, current away

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from the lake at the sampling station.

There is no historical data at this station with which to compare the 1965 values. Even if there were, the present operation of the O'Brien locks would void most of the comparability of the two sets of data. However, comparing the present data to sampling by the GLIRB Project in the center of the harbor during July and September of 1963, the values for pH, DO, sulfate, ammonia nitrogen, and phenols all appear to have the same average values and cover about the same range of values for each of the parameters.

Calumet Harbor at State Line and Mid-Channel CR 334.0

The data from the sampling stations in Calumet Harbor have been combined for this analysis giving a total of ten samples. During July and most of August the harbor was sampled at the State Line opposite the entrance to the Calumet River. Beginning with the last week in August the sampling point was moved to a point about 3,500 feet from the entrance to the river. The station was moved because it is believed that the new location will give a more representative sample of the water quality in this harbor. The normal summer current pattern as shown in Figure V-5 indicates that the original sampling station would not adequately monitor the wastes discharged into the Calumet harbor by U. S. Steel Company north of the Calumet River.

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Comparing the 1965 data with the results of the GLIRB Project's sampling in July and September, 1963 shows that there has been little change in the pH or sulfates content of the water. The dissolved oxygen content of the water in the harbor has increased slightly, and a small decrease in the ammonia nitrogen content is noted. Eighteen phenol samples in 1963 ranged in value from zero to 5.3 $\mu\text{g/l}$ with an average of 1.4 $\mu\text{g/l}$. In 1965 the maximum value of ten samples was 3 $\mu\text{g/l}$, the minimum and median value was zero, and the average value was only 1 $\mu\text{g/l}$.

Little Calumet River at Wentworth Ave. LC 332.2

This sampling station is located about a half-mile downstream from the Illinois-Indiana State line on the Little Calumet River. The closest sampling point for historic data is just over a mile upstream at Hohman Avenue, where from 11 to 20 analyses on samples were obtained by the GLIRB Project in August and September 1963. All 20 samples in 1963 had a DO of zero while 19 samples in 1965 had a median DO value of 1.5, although three of the samples had a value of zero and five others had a value of less than 1 mg/l. However, a maximum value of almost 5 mg/l was attained by two samples. The BOD and COD values shows a notable reduction since the 1963 sampling period. The average value for BOD dropped from 20 mg/l in 1963 to 13 mg/l in 1965. The average

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value of COD for 11 samples in 1963 was 61 mg/l, while the average value for 19 samples in 1965 was 45 mg/l. The average values for ammonia nitrogen shows a similar reduction from 6.7 mg/l to 2.1 mg/l. As expected with the increase in dissolved oxygen, the average nitrate nitrogen sample showed an increase from 0.3 mg/l to 1.3 mg/l. Phosphates also show a reduction in their average values dropping from 10 mg/l in 1963 to 5.3 mg/l in 1965. A large reduction was also noted in suspended and dissolved solids. The average value for suspended solids dropped from 175 mg/l in 1963 to 35 mg/l in 1965, while the dissolved solids dropped from 610 mg/l to 470 mg/l during the same period. As noted in the bacteriology section of this report, the increase in the quality of water at this station, as noted by comparing the 1965 results with those obtained in 1963 is probably due, in part at least, to the treatment of a part of the domestic wastes of the communities of Highland and Griffith by the Hammond Municipal Sewage Treatment Plant.

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VII BIOLOGICAL SURVEYS

In March, 1965 a project biologist made a three-day biological survey of the Calumet Area. Observations from this survey are given in Table VII-1. The stations are located on a map of the area in Figure VII-1. Comparing the biological data obtained in March 1965 with surveys in 1961 indicates that there had been no substantial change in the biological conditions either for the better or worse in the Calumet Area in the past five years.

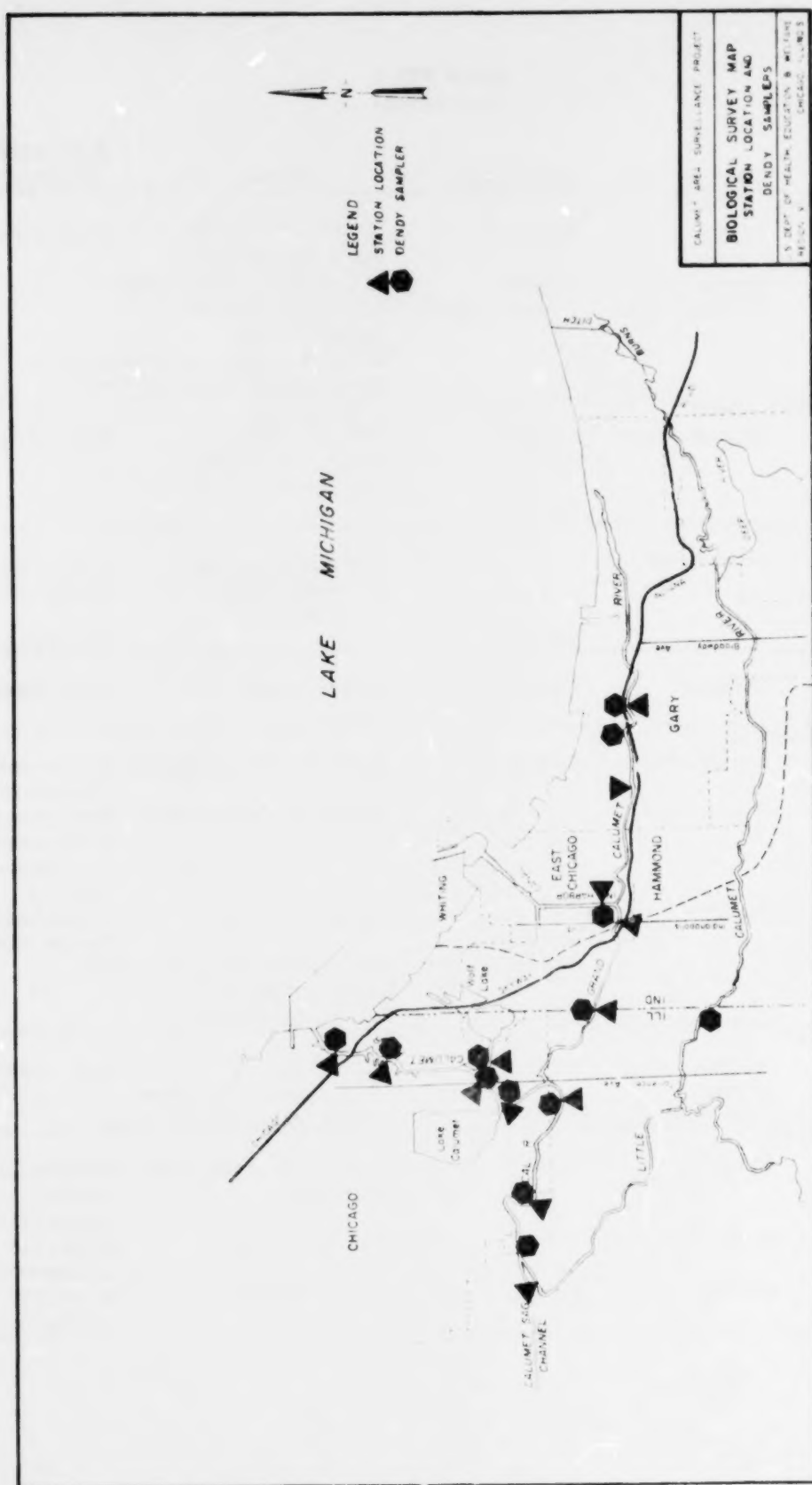
(Table VII-1 and Figure VII-1 follow:)

TABLE VII-1
CALUMET AREA BIOLOGICAL SURVEY, MARCH 17-19, 1965

Station	Secchi Disc (m)	D.O. mg/l	pH	Temp. °C	Depth (m)	Bottom Type
Grand Calumet River						
GC 344.8	0.25	4.4	7.40	23.00	1.0	Iron particles
GC 336.0	0.25	5.4	7.30	21.25	1.5	Ooze
GC 332.2	0.25	4.0	7.25	22.00	1.5	Ooze, Detrit.
GC 331.1	0.25	5.7	7.45	19.00	0.5	Ooze
GC 325.8	0.50	2.9	7.80	21.00	1.0	Ooze, sand
Indiana Harbor Canal						
IH 331.9	0.25	3.0	7.05	22.00	1.0	Ooze, silt
IH 335.2	0.30	3.0	8.65	21.50	6.5	Ooze
IH 335.5	0.30	-	-	21.00	6.5	Ooze
Indiana Harbor						
1	0.30	3.7	8.50	21.50	5.5	Ooze
2	0.75	5.4	8.00	17.00	10.0	Ooze
3	1.00	5.5	8.00	19.00	7.5	Ooze
Thorn Creek						
TC 330.3	To bottom	6.9	8.50	18.00	0.5	Ooze, silt, sand
Little Calumet River						
LC 351.1	0.5	4.6	8.15	17.50	0.7	Black ooze
LC 337.2	0.2	0.0	7.80	21.00	0.3	Ooze, silt
LC 334.9	0.2	8.8	3.20	19.00	0.3	Sand, Detritus
LC 328.0	0.3	9.7	8.30	18.00	0.5	Gravel
Thornton Road	0.4	3.3	7.90	17.50	0.5	Silt, sand
LC 319.7	0.5	2.9	8.25	17.50	1.0	Silt, sand
LC 320.1	0.5	2.0	8.15	19.50	2.0	Ooze, silt
LC 322.4	0.5	2.9	8.30	20.00	3.0	Ooze
Calumet River						
CR 327.0	1.0	3.6	8.30	22.0	4.5	Clay
CR 328.1	0.5	1.7	7.90	23.5	5.5	Clay, ooze, sand
CR 333.0	0.2	7.2	8.30	17.0	7.0	Rust color ooze
Calumet Harbor						
1	0.4	7.7	8.30	18.0	9.0	Ooze, silt
2	1.5	8.2	8.20	15.0	9.0	Clay, silt
3	2.5	8.9	8.20	16.0	10.5	Silt

TABLE VII-1
(Continued)

Station	Bottom Odor	Water Odor	Notes	Predominate Organisms
Grand Calumet R.				
GC 344.8	Petro	Sewage	Heavy oil slicks, rusty water color	None observed
GC 336.0	Sewage	Sewage	Oil slicks, oily banks	" "
GC 332.2	Sewage, Petro	Sewage, Petro	Murky, Oil slicks, slimy banks	" "
GC 331.1	" "	" "	Slime & algae on bottom	"
GC 325.8	" "	" "	Murky, black oily patch	"
Indiana Hrbr. Canal				
IH 331.9	Sewage, Petro	Sewage	Turbid, murky	None observed
IH 335.2	" "	Petro	Murky, oil slicks, dk. brown color	" "
IH 335.5	" "	Sewage, Petro	" " "	" "
Indiana Harbor				
1	Sewage, Petro	-	Murky, oil slicks	None observed
2	" "	-	Lt. brown, murky, oil slicks	Sludgeworms
3	" "	Sewage, Petro	" " " "	Leeches, snails
Thorn Creek				
TC 330.3	Sewage	Sewage	Debris, algae cov. rocks	None observed
Little Calumet R.				
LC 351.1	Sewage, Petro	Sewage	Water greenish, marshy	Sludgeworms, bloodworms
LC 337.2	Raw Sewage	"	Abundant blue-greens	None observed
LC 334.9	"	"	" " "	Sludgeworms, bloodworms, mayfly
LC 328.0	Sewage	"	Green water color	Oligochaeta
Thronton Rd.	"	Normal	" " "	Sludgeworms
LC 319.7	"	Sewage	Water greenish, oil slicks	"
LC 320.1	"	"	Water brownish, "	" "
LC 233.4	"	"	Oil along shores	"
Calumet River				
CR 327.0	Normal	Normal	Oil slicks	None observed
CR 328.1	Sewage	-	" ", brownish water	" "
CR 333.0	Dead fish	Normal	Purple wtr, popcorn slag	" "
Calumet Harbor				
1	Petro	Normal	Water red-brown, dead alewives	Leeches, sludge-worms, sphaeriid clams
2	Metallic	"	Dead alewives	Sphaeriid clams, sludgeworms
3	Normal	Normal	Water clearer	Sphaeriid clams, sludgeworms



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The Calumet Area Surveillance Project also installed Dendy type biological samplers in the streams in the Calumet Area. These Samplers were made of a series of 4" square plates made of 1/8" masonite with 1" square pieces of masonite as spacers. The larger squares painted with fiber glass resin and sprinkled with either crushed clam shells, coarse sand or hardwood sawdust and shavings. Eleven of these plates with spacers between are placed on a 1/4" threaded rod to form one sampler. Each sampler has ten slots, five of the slots covered on each face with one substrate material and five with a second type of surface.

Seven of these samplers were placed in the Little Calumet and Grand Calumet Rivers and the Indiana Harbor Canal during the week of October 4-8, and were retrieved in early November. Bottom samples were also obtained at each location so that a comparison of the organisms found on the Dendy sampler to an equal area of stream bottom could be made.

Bloodworms and sludgeworms were present at most of the locations. In addition, pulmonate snails were found on the sample removed from the Grand Calumet River at the Indianapolis Boulevard station. These are all pollution-tolerant organisms.

Six Dendy type samplers were also placed on the Calumet River and one in Wolf Lake. The location of the Dendy

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samplers is shown in Figure VII-1. Bottom samples were also obtained at these locations when the samplers were removed.

The information gained from these biological surveys will provide valuable reference data on which to evaluate any future changes in biological conditions and water quality.

* * *

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My summary is as follows:

Introduction

A conference on pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Wolf Lake, Lake Michigan and their tributaries (Indiana-Illinois), called by the Secretary of Health, Education, and Welfare under the provisions of Section 8 of the Federal Water Pollution Control Act of 1961 as amended, was held in Chicago, Illinois, March 2-9, 1965.

Recommendation No. 14 of the Summary of the conference provided that: "Surveillance will be the primary responsibility of the Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board and the Metropolitan Sanitary District of Greater Chicago. The Department of Health, Education, and Welfare will make available a resident technical group and visiting groups of experts which will assist the State agencies and the Metropolitan Sanitary District of Greater Chicago at such time as requested by them."

The State of Indiana, on April 6, 1965, and the State of Illinois, on April 16, 1965, requested an extensive sampling program by the Federal government to monitor the water quality in the Calumet Area. These requests accompanied sampling programs proposed by them within their respective jurisdictions. The Metropolitan Sanitary District also

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cooperated in laboratory programs and in special studies that have been conducted on effluent chlorination at one of their sewage treatment plants.

Scope

The report presents an evaluation of present water quality in the Calumet Area based primarily on the Department of Health, Education, and Welfare's Surveillance activity. However, all agencies cooperated in studies of the bacteriological quality of the water at six beaches. Those data are presented in this report. The chemical, physical, microbiological and biological data from stream and harbor stations are those obtained from Surveillance Project activities only and do not include information from the monitoring work of the other agencies. They will discuss their findings later in the conference.

The beaches that were sampled bacteriologically were:

Rainbow
Outer Calumet
Inner Calumet
Hammond
Whiting
East Chicago

Stream and harbor stations sampled routinely by

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the Calumet Area Surveillance Project were as follows. I think Mr. Ray Johnson is pointing these out, but I can't see him from here.

Little Calumet River at Wentworth Avenue.

Grand Calumet River at Indiana Harbor Belt Railroad Bridge.

Grand Calumet River at B.O. Terminal Bridge.

Grand Calumet River at Broadway

Grant Calumet River at Pennsylvania Railroad Bridge.

Indiana Harbor Canal at 151st Street.

Indiana Harbor Canal at Dickey Road.

Indiana Harbor Canal Inner Light.

Indiana Harbor Canal Outer Light.

Calumet Harbor at Mouth of Calumet River.

Calumet Harbor on State Line

Calumet Harbor at Mid Channel

Wolf Lake at State Line

Wolf Lake Channel

Biological observations were made at the above stations and at 11 additional stations throughout the area.

In addition to the normal sampling program, two continuous automatic monitors are being installed. One is located on the Indiana Harbor Canal, and one will be located on the Calumet River. Two more monitors will be installed

later in the year.

Six water level recording stations have been installed on the Grand Calumet River and the Indiana Harbor Canal. Data from these gages and from U. S. Geological Survey and Metropolitan Sanitary District gages on other streams of the area, will be used for stream flow calculations in the Calumet system.

Summary of Findings

1. Beaches. Individual coliform bacteria densities determined by the Calumet Surveillance Project at the six beaches ranged from near zero to about 360,000 per 100 ml. The following is a list of beaches and the per cent of time from June 1, 1965 to September 15, 1965 that the water quality did not meet the Proposed Calumet Area Technical Committee Criteria for beaches.

<u>Beach</u>	<u>Per Cent</u>
Rainbow	74
Outer Calumet	57
Inner Calumet	91
Hammond	100
Whiting	60
East Chicago	61

The highest mean values for the season were about 8,000 per 100 ml at Hammond and Whiting; Inner Calumet was about 4,000 per 100 ml; Outer Calumet and East Chicago were

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about 2,000 ml; and Rainbow Beach was about 1,100 per 100 ml.

The highest individual determination, 360,000 per 100 ml, was at Hammond Beach. The Hammond City Health Department closed this beach several years ago.

2. Indiana Harbor. Coliform bacteria were found in mean densities of about 300,000 per 100 ml in Indiana Harbor. Phenols ranged from six to 21 $\mu\text{g/l}$; the mean total phosphate concentration was 0.16 mg/l; and the following mean values were also found in Indiana Harbor:

Sulfates	51 mg/l
Ammonia Nitrogen	1.1 mg/l
Dissolved Oxygen	3.4 mg/l

3. Calumet Harbor. The mean value of coliform densities were found to be about 1500 per 100 ml with maximum values of 10,000 per 100/ml. Phenol concentrations were as high as 3 $\mu\text{g/l}$. The mean total phosphate concentration was .15 mg/l with a maximum of .78 mg/l. Maximum values of 37 mg/l for sulfates, and 0.27 mg/l for ammonia nitrogen were also found.

4. Grand Calumet River at the State line. Minimum coliform bacteria densities were found to be 100,000 per 100 ml with counts as high as 9,000,000 per 100 ml. Mean phenol concentration was 18 $\mu\text{g/l}$. Total phosphates ranged as high as 12 mg/l at the State line and as high as 40 mg/l

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one-half mile downstream from this point. The mean value at the State line showed total phosphate to be 7.7 mg/l. Sulfates ranged from a minimum of 52 mg/l to 282 mg/l with the mean being 179 mg/l. The mean of the dissolved oxygen values was 2.7 mg/l with a minimum value found of zero D.O. Dissolved oxygen values were at or near zero 50 per cent of the time.

5. The Little Calumet River at the State line.

Coliform bacteria densities ranged from about 10,000 to 400,000 per 100 ml. Total phosphates were sampled at a maximum of 14 mg/l and sulfates as high as 310 mg/l. The mean value for phenols was 8 µg/l with a maximum of 38 µg/l. Dissolved oxygen values were as low as zero with the mean being 1.8 mg/l. About half of the time dissolved oxygen values were at or near zero.

Summary and Conclusions

1. Based on the criteria of bathing water having a total coliform count of less than 1,000 per 100 milliliter, the water quality at the six Lake Michigan beaches in the Calumet Area was unsuitable for bathing from 31 per cent to 100 per cent of the time. Calumet Park, Whiting, and Hammond beaches had periods of extremely high bacterial contamination. The Calumet Park, Whiting, and Hammond beaches are subject to periods of extremely heavy pollution.

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2. Indiana Harbor is grossly polluted as evidenced by high total coliform and fecal Streptococcus counts. Phenols, though reduced from 1963 levels, were still high enough to cause taste and odor problems at times in near municipal water supplies. Total phosphates average almost five times the value required for algal blooms. There were still many visual signs of pollution such as oil on the surface. and sludge banks in the stream bottoms.

3. Calumet Harbor sampling revealed a slight increase in the dissolved oxygen content, a decrease in the phenols, and bacterial concentrations that were slightly higher than obtained during the 1963 sampling period. Iron, ammonia nitrogen, and total dissolved solids were all above the background levels found in Lake Michigan. Average total phosphates were five times the value required for algal blooms. There was also visual evidence of large quantities of wastes being discharged to lower portions of the Calumet River and Calumet Harbor. The operation of the O'Brien Lock and Dam and the slightly higher water levels of Lake Michigan in 1965 partly reduced waste inputs to Lake Michigan from this source.

4. The Grand Calumet River at the State line was still grossly polluted as evidenced by very high bacterial counts. Ten per cent of the samples collected in 1965 had a

Gover Cook

zero dissolved oxygen content and 25 per cent had an oxygen content of less than one milligram per liter. Pollution was also indicated by the high Biochemical Oxygen Demand, Chemical Oxygen Demand, phenol, and dissolved solid values found during the sampling period.

5. The Little Calumet River at the State line was still grossly polluted, although there was an improvement since the 1963 sampling period. Bacterial counts were still above acceptable levels, 15 per cent of the samples had dissolved oxygen content of zero and 40 per cent had an oxygen content of less than one milligram per liter. Biochemical Oxygen Demand, Chemical Oxygen Demand, total phosphates, sulfates, and dissolved solids, although less than 1963 values, were still very high.

In brief, then, this report shows that:

The Grand Calumet River is still grossly polluted.

The Little Calumet River is slightly improved over 1963 but still very polluted.

So with minor exceptions, there has been no significant improvement in water quality anywhere in the conference area since the February 1965 report to the conference.

MR. STEIN: Any comments or questions?

(No response.)

If not, I call on Mr. Poston.

Francis Kittrell

MR. POSTON: I would like to call upon Mr. Francis Kittrell, chairman of the Technical Committee, to summarize the committee report at this time.

Mr. Kittrell.

STATEMENT OF

FRANCIS KITTRELL, CHAIRMAN OF TECHNICAL COMMITTEE

MR. KITTRELL: Mr. Chairman, conferees, ladies and gentlemen:

My statement is briefed from the report on water quality criteria for the Calumet Area, Lower Lake Michigan. I would like that entire report entered into the record.

MR. STEIN: Without objection, this will be done.

(The report referred to follows:)

Francis Kittrell
REPORT OF
WATER QUALITY CRITERIA
CALUMET AREA-LOWER LAKE MICHIGAN
DECEMBER 1965

TECHNICAL COMMITTEE

Members

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Chicago, Illinois

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East Chicago, Indiana

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Metropolitan Sanitary District
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TECHNICAL COMMITTEE

(Continued)

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Indiana Stream Pollution
Control Board
Indianapolis, Indiana

None

Mr. R. S. Nelle
Illinois Sanitary Water
Board
Springfield, Illinois

Mr. Benn J. Leland
Illinois Sanitary Water Board
Chicago, Illinois

- - -

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WATER QUALITY CRITERIA

CALUMET AREA-LOWER LAKE MICHIGAN

INTRODUCTION

This report on the Calumet Area and Lower Lakes of Michigan is adapted from a report "Recommended Water Quality Criteria" submitted by a Technical Committee appointed in April, 1965.

A conference on pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Wolf Lake, Lake Michigan and their tributaries (Indiana-Illinois), called by the Secretary of Health, Education, and Welfare under the provisions of Section 8 of the Federal Water Pollution Control Act (33 USC 466 et seq.), was held in Chicago, Illinois, March 2-9, 1965.

Conclusions and recommendations of the conferees included the following items that are pertinent to this report:

"The conferees will establish a technical committee as soon as possible which will evaluate water quality criteria and related matters in the area covered by the conference and make recommendations to the conferees within six months after the issuance of the summary of the conference."

"The Indiana Stream Pollution Control Board, the

Francis Kittrell

Illinois Sanitary Water Board, and the Metropolitan Sanitary District of Greater Chicago, maintaining close liaison with the technical committee created by the conferees will develop a time schedule for the construction of necessary industrial waste treatment facilities. Such a schedule shall be submitted to the conferees for their consideration within six months after the issuance of the summary of this conference."

Subsequently the conferees met on April 7, 1965 and appointed the technical committee which held its initial session on the same date. Since then the committee has met at approximately two-week intervals, with most of the meetings continuing for two days.

The committee consisted of one representative of each of the four regulatory agencies (the States of Illinois and Indiana, the Metropolitan Sanitary District of Greater Chicago, and the Federal government), two representatives of industry (U. S. Steel Corporation and American Oil Company) and one each of the City of Chicago Department of Water and Sewers, and the U. S. Department of the Interior.

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GUIDE LINES FOR ADOPTING BASIC CRITERIA

At its second meeting the committee agreed on the following guidelines for its deliberations:

"Water quality criteria for various uses will be applied to the existing situations. The criteria that are developed will recognize the existing water quality, the need for improvement of water quality in certain areas, and the possibility that criteria will not be limited by existing levels in all cases. It is realized that quality criteria set at present cannot be binding for all time but will need reconsideration and possible revision at regular intervals in the future. Water quality needs for present and potential uses will be considered. Effluent standards will not be considered by this committee."

Considerable discussion was devoted to definition of the phrase "water quality criteria" used by the conferees in their charge to the committee. Relying on the usual interpretation of the word "criteria," it was concluded that the conferees intended that limits of constituents recommended by the committee would be used as guides in judging the suitability of water quality for various uses and in planning improvements in water quality through waste reductions where needed, but would not necessarily be applied as standards or requirements.

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BASES FOR DEVELOPMENT OF CRITERIA

After considering various bases for development of water quality criteria the committee agreed that criteria should be based on:

1. Present and potential water uses.
2. Preservation of present good quality.
3. Improvement of degraded quality where technically and economically feasible.
4. Reconsideration and revision of regular intervals as future developments may dictate.

It was concluded that adoption of uniform criteria for specific uses, regardless of location of uses, would not provide a practical basis for a pollution abatement program for lake waters. For example, the sheltered areas between the Calumet Harbor Breakwater and the Indiana Harbor Bulkhead (Figure 1 - Appendix) receives the major discharges from waste sources. Obviously, it is impractical to expect water of the same high quality in this area, regardless of the degree of waste treatment achieved, as that which will be found several miles out in the open lake. If the sources of municipal supply in the sheltered area are given adequate protection, the water in the open lake inevitably will be of still better quality.

Based on this reasoning, the water area of the lower

Francis Kittrell

lake was divided into three zones as shown in Figure 1. Most of the water area is defined as Open Water, which is that area more than 200 yards offshore and outside of a line from the outer end of the Calumet Harbor Breakwater to and along the outer edge of the Inland Steel Bulkhead Line and thence through the U. S. Steel Water Supply intake to the outer end of the Gary Harbor Breakwater. The Inner Harbor Basins is the area shoreward of the above line, but not including Shore Water. Shore Water is all water within 200 yards of shore except in the Inner Harbor Basins, where it is that water within 200 yards of existing onshore recreational areas.

Other water bodies for which criteria were developed included the Little Calumet River, the Grand Calumet River, and Wolf Lake. The reach of the Little Calumet River involved is from the State line to the confluence with Cal-Sag Channel. In accordance with Federal jurisdiction in interstate enforcement it was concluded that the committee should concern itself with only those reaches of the two rivers that are downstream from the State line in Illinois, and with that portion of Wolf Lake that lies in Illinois.

General water use categories were adopted for the development of criteria. These water uses are:

1. Municipal Water
2. Industrial Water

Francis Kittrell**Process - Cooling****3. Recreation****a. Whole Body Contact****b. Limited Body Contact****4. Fish and Wildlife****5. Commercial Shipping****6. Esthetics****7. Wastewater Assimilation**

Existing and potential uses of the delineated bodies of water for which quality criteria were considered are noted in Table I (Appendix). The locations of principal water uses are shown in Figures 2A and 2B. (Appendix) Although there has been use of water for irrigation in the Little Calumet Basin, it has been so limited that it was concluded this very minor use did not justify special consideration.

Constituents for which water quality criteria were considered for each of the bodies of water are indicated in Tables II through VI (Appendix). It should be noted that the constituents for both Open Water and the Inner Harbor Basins, given in Table II, are the same.

Criteria first were selected for each constituent for each water use in each area. Once the complete tabulation of criteria for all water uses in an area had been developed,

Francis Kittrell

the most stringent criteria for any of the water uses were selected as the governing values for that area.

Some of the criteria recommended are at or near the lower limits of detectability of analytical procedures included in "Standard Methods for the Examination of Water and Wastewater." The committee concludes that "Standard Methods" of analysis should be employed where applicable, but recognizes that other approved methods may be required in judging compliance with some of the criteria. For example, the committee recommends a limit of 0.025 mg/l of cyanide for protection of fish. The limit of detectability of this compound by the "Standard Methods" procedure is 0.1 mg/l, but the accepted method used by the Great Lakes-Illinois River Basin Project Laboratory has a precision of 0.01 mg/l.

Successful application of the criteria requires that analytical results be reproducible among the several laboratories involved in the program. A round-robin program of replicate sample analysis recommended by the committee has been initiated by the laboratories to ensure reproducibility of results.

A major, and probably the major, water quality problem of the area is taste and odor in municipal water supplies. The types of taste and odor most difficult and costly to control by water treatment are "chemical," or "hydrocarbon."

Francis Kittrell

and "medicinal," or "phenolic." Since the "Standard Method" for threshold odor is recognized as subjective rather than objective, it is especially important that every effort be exerted to ensure the maximum possible reproducibility of threshold odor results among the laboratories.

CRITERIA

The criteria recommended by the committee are incorporated in the following tables, 1 through 6. The committee feels that it is establishing a precedent in recommending criteria which, if attainable, will ensure the highest quality water that is reasonably feasible.

(Tables 1 through 6 follow:)

TABLE 1

CRITERIA

OPEN WATER

Control Points - Chicago South District Filtration Plant and
Gary-West Plant IntakesColiform Bacteria - MPN/100 ml

Annual Average (Arithmetic)	Not more than	200
Single Daily Value or Average (1)	Not more than	2,500

<u>Streptococci</u> - Number/100 ml (Tentative) (2)	Not more than	25
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Turbidity

No turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of the water.

True Color - Units

Annual Average	Not more than	5
Single Daily Value or Average	Not more than	15

Threshold Odor (Hydrocarbon and/or Chemical) (3)

Daily Average	Not more than	4
Single Value	Not more than	8

Odor

No obnoxious odor of other than natural origin.

<u>Temperature</u> - °F	Not more than	85
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Oil

Substantially free of visible floating oil.

Floating Solids and Debris

Substantially free of floating solids and debris from other than natural sources.

Bottom Deposits

Substantially free of contaminants that will: (1) adversely alter the composition of the bottom fauna; (2) interfere with the spawning of fish or their eggs; (3) adversely change the physical or chemical nature of the bottom.

CRITERIA (CONT'D)

OPEN WATER

pH - Units

Annual Median	Within range 8.1 - 8.4
Daily Median	Within range 7.7 - 9.0

Dissolved Oxygen - Per Cent Saturation

Annual Average	Not less than 90
Single Value	Not less than 80

Ammonia Nitrogen (N) - mg/l (4)

Annual Average	0.02
Single Daily Value or Average	0.05

Total Nitrogen (N) (4)

0.4

Methylene Blue Active Substance - mg/l

Annual Average	Not more than 0.05
Single Daily Value or Average	Not more than 0.20

Chlorides (CL) - mg/l

	1965	1970	1980	1990	2000
Annual Average	Not more than 8	9	10	11	12
Single Daily Value or Average	Not more than		15(through 1970)		

Cyanides (CN) - mg/l

Single Value	Not more than 0.025
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Fluorides (F) - mg/l

Annual Average	Not more than 1.0
Single Daily Value or Average	Not more than 1.3

Dissolved Iron (Fe) - mg/l

Annual Average	Not more than 0.15
Single Daily Value or Average	Not more than 0.30

Phenol-Like Substances - mg/l (Tentative) (5)

Annual Average	Not more than 0.001
Single Value	Not more than 0.003

Sulfates (SO₄) - mg/l

	1965	1970	1980	1990	2000
Annual Average	not more than 23	24	26	28	30
Single Daily Value or Average	Not more than	50 (through 1970)			

CRITERIA (CONT'D)
OPEN WATER

Total Phosphates (PO_4) - mg/l (Tentative) (6)

Annual Average	Not more than 0.03
Single Daily Value or Average	Not more than 0.04

Filtrable Residue (Total Dissolved Solids (mg/l)

	1965	1970	1980	1990	2000
Annual Average	162	165	172	179	186
Single Daily Value or Average	Not more than 200 (through 1970)				

Miscellaneous Trace Contaminants and Radionuclides

Shall not be present in concentrations that will prevent meeting PHS 1962 Drinking Water Standards after conventional treatment.

- (1) If more than one sample per day is examined, the limit shall be the daily average. If only one sample per day is taken, the single value shall govern.
- (2) Pending accumulation of adequate data on existing densities of *Streptococcus*. Probably can be lowered.
- (3) The Chicago South District Filtration Plant Control Laboratory will be the reference laboratory for Threshold Odor.
- (4) Tentative pending study of additional data and evaluation of potential reductions at the sources.
- (5) Pending study of additional data and evaluation of potential reductions at the sources.
- (6) Pending thorough determination of existing concentration in Lower Lake Michigan Conference Area.

TABLE 2
CRITERIA
INNER HARBOR BASINS

Control Points - Hammond and East Chicago Water Intakes

Coliform Bacteria - MPN/100 ml.

Annual Average (Arithmetic)	Not more than 2,000
Single Daily Value or Average	Not more than 5,000 (1)

<u>Fecal Streptococci</u>	Not more than 100
---------------------------	-------------------

Turbidity - No turbidity of other than natural origin that will cause substantial visible contract with the natural appearance of water.

True Color - Units

Annual Average	Not more than 5
Single Daily Value or Average	Not more than 15

Threshold Odor (Hydrocarbon and/or Chemical) Units (2)

Annual Average	Not more than 8
Single Daily Value or Average	Not more than 20

Odor - No obnoxious odor of other than natural origin.

<u>Temperature</u> - °F	Not more than 85
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Oil - Substantially free of visible floating oil.

Floating Solids and Debris - Substantially free of floating solids and debris from other than natural sources.

Bottom Deposits - Substantially free of muck and debris of other than natural origin.

pH - Units

Annual Median	Within range 8.0 - 8.5
Daily Median	Within range 7.5 - 9.0

Dissolved Oxygen - Per Cent Saturation

Annual Average	Not less than 80
Single Daily Value or Average	Not less than 65

Ammonia Nitrogen - mg/l (2)

Annual Average	0.05
Single Daily Value or Average	0.12

Methylene Blue Active Substance - mg/l

Annual Average	Not more than 0.10
Single Daily Value or Average	Not more than 0.30

CRITERIA (CONT'D)
INNER HARBOR BASINS

Chlorides - mg/l

Annual Average	Not more than	$\frac{1965}{16}$	$\frac{1970}{18}$	$\frac{1980}{20}$	$\frac{1990}{22}$	$\frac{2000}{24}$
Single Daily Value or Average	Not more than	30 (thru 1970)				

Cyanides - mg/l

Single Value	Less than	0.1
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Fluorides - mg/l

Annual Average	Not more than	1.0
Single Daily Value or Average	Not more than	1.3

Dissolved Iron - mg/l

Annual Average	Not more than	0.15
Single Daily Value or Average	Not more than	0.30

Phenol-like Substances - mg/l (Tentative) (2)

Annual Average	Not more than	0.002
Single Daily Value or Average	Not more than	0.005

Sulfates - mg/l

Annual Average	Not more than	$\frac{1965}{35}$	$\frac{1970}{36}$	$\frac{1980}{39}$	$\frac{1990}{42}$	$\frac{2000}{45}$
Single Daily Value or Average	Not more than	75 (through 1970)				

Total Phosphates - mg/l (Tentative) (2)

Annual Average	Not more than	0.05
Single Daily Value or Average	Not more than	0.10

Filterable Residue (Total Dissolved Solids) - mg/l

Annual Average	Not more than	$\frac{1965}{187}$	$\frac{1970}{190}$	$\frac{1980}{197}$	$\frac{1990}{204}$	$\frac{2000}{211}$
Single Daily Value or Average	Not more than	230 (through 1970)				

Miscellaneous Trace Contaminants and Radionuclides

Shall not be present in concentrations that will prevent meeting PHS 1962 Drinking Water Standards after conventional treatment.

- (1) Except during periods of storm water overflow when coliform should not exceed 24,000/100 ml.
- (2) Tentative pending study of additional data and evaluation of potential reductions at the sources.

If more than one sample per day is examined, the limit shall be the daily average. If only one sample per day is taken, the single value shall govern.

TABLE 3
CRITERIA
SHORE WATER

Control Points - Existing Sampling Points at Bathing Beaches.

Bacteria - Number per 100 ml by MF Techniques (Tentative) (1)

- a) The number of bacteria shall be the Arithmetic Average of the last five consecutive sample results.
- b) Satisfactory area if MF Coliform are less than 1000 and MF Fecal Streptococci are less than 100.
- c) Satisfactory area if MF Coliforms are from 1000 to 5000 and MF Fecal Streptococci are less than 20.
- d) A single sample results of over 100,000 Coliforms shall require immediate investigation as to the cause. Items to be considered in the judgment of cause and action to be taken include the sanitary survey, winds, currents and weather conditions.

Turbidity

No turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of water.

True Color - Units

Annual Average	Not more than 5
Single Daily Value or Average	Not more than 15

Odor

No obnoxious odor of other than natural origin.

Temperature - °F

Not more than 85

Oil

Substantially free of visible floating oil.

Floating Solids and Debris

Substantially free of floating solids and debris from other than natural sources.

Bottom Deposits

Substantially free of muck and debris of other than natural origin.

CRITERIA (CONT'D)
SHORE WATER

pH - Units

Daily Median	Within range 7.0 - 9.0
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Dissolved Oxygen - Per Cent Saturation

Annual Average	Not less than 90
Single Value	Not less than 80

Ammonia Nitrogen (N) - mg/l (Tentative) (2)

Annual Average	Not more than 0.05
Single Daily Value or Average	Not more than 0.12

Methylene Blue Active Substance - mg/l

Annual Average	Not more than 0.02
Single Daily Value or Average	Not more than 0.05

Cyanides (CN) - mg/l

Single Value	Not more than 0.025
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Phenols - Like Substances - mg/l (Tentative) (2) Not more than 0.05

Total Phosphates (P₀₄) - mg/l (Tentative) (3)

Annual Average	Not more than 0.03
Single Daily Average or Value	Not more than 0.04

Miscellaneous Trace Contaminants and Radionuclides

Shall not be present in concentrations that will prevent meeting the PHS 1962 Drinking Water Standards after conventional treatment.

- (1) Pending evaluation of data on bathing beaches during 1965 which are now being collected.
- (2) Pending study of additional data and evaluation of potential reductions at the sources.
- (3) Pending thorough determination of existing concentrations in Lower Lake Michigan Conference Area. Lower limits may be desirable.

If more than one sample per day is examined, the limit shall be the daily average. If only one sample per day is taken, the single value shall govern.

TABLE 4
CRITERIA
LITTLE CALUMET RIVER

Control Point - Wentworth Avenue Bridge.

Coliform Bacteria - MPN/100 ml.

Maximum Value 5000 except during periods of storm water runoff.

Fecal Streptococcus

Maximum value 500 except during periods of storm water runoff.

Turbidity

No turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of the water.

True Color - Units

Annual average not more than 25

Single Daily value or average not more than 50⁽¹⁾

Odor

No obnoxious odors of other than that of natural origin.

Temperature °F

Single daily value or average not more than 90.

Oil

Substantially free from visible floating oil.

Floating Solid and Debris

Substantially free of floating solids and debris from other than natural sources.

Bottom Deposits

Substantially free of sludge banks.

pH - Units

Annual median within range 6.5 - 9.0

CRITERIA (CONT'D)

LITTLE CALUMET RIVER

Dissolved Oxygen - mg/l

Average (May thru September) not less than 4.0

Single daily value or average not less than 2.0

BOD - mg/l

Single daily value or average not more than 10.0

Ammonia Nitrogen - mg/l (2)

Single daily value or average not more than 1.5

Methylene Blue Active Substance - mg/l

Single daily value or average not more than 0.5

Cyanides - mg/l

Single daily value or average not more than 0.025

Phenol-like Substances - mg/l

Single daily value or average not more than 0.02

Total Phosphates - mg/l (2)

Held for additional data analysis. (Appears to be from surface runoff.)

- (1) If more than one sample per day is examined, the limit shall be the daily average. If only one sample per day is taken, the single value shall govern.
- (2) Tentative pending study of additional data and evaluation of potential reductions at the sources.

TABLE 5
CRITERIA
GRAND CALUMET RIVER⁽¹⁾

Control Point - Baltimore and Ohio Chicago Terminal Railroad Bridge.

Coliform Bacteria MPN/100 ml. (Tentative)

Maximum Value 5000 except during periods of storm water runoff.

Fecal Streptococci

Maximum value 500 except during periods of storm water runoff.

True Color - Units (Tentative)

Annual Average		25
Single Daily Value or Average ⁽²⁾	Not more than	50

Odor

No obnoxious odors of other than that of natural origin.

<u>Temperature °F</u>	Not more than	90
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Oil

Substantially free of visible floating oil.

Floating Solids and Debris

Substantially free of floating solids and debris from other than natural sources.

Bottom Deposits

Substantially free of sludge banks.

pH - Units

Annual Median	Within range 6.5 - 9.0
---------------	------------------------

Dissolved Oxygen - mg/l (Tentative)

Average (May thru September)	3.0
Single Daily Value or Average	Not less than 1.0

BOD - mg/l (Tentative)

Single value	Less than 10.0
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CRITERIA (CONT'D)

GRAND CALUMET RIVER

Ammonia-Nitrogen - mg/l (Tentative)

Single Value	Not more than 5.0
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Methylene Blue Active Substances - mg/l (Tentative)

Single Value	Not more than 0.5
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Chlorides - mg/l (Tentative)

Annual Average	75
Single Daily Value or Average	Not more than 125

Phenol - Like Substances - mg/l (Tentative)

Single Value	Not more than 0.020
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Total Phosphates - mg/l (Tentative)

Held for additional data analysis

Filterable Residue (Total Dissolved Solids) mg/l (Tentative)

Single Value	Not more than 500
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- (1) It is recognized that the Grand Calumet River at the State Line is essentially treatment plant effluent from Hammond due to the nature of the natural drainage flow.

In addition to the concentration limits, the pounds per day of each constituent shall be limited to the loads that would occur at these concentrations with a flow of 20 cfs.

Combined storm water overflows shall be eliminated as soon as possible.

Criteria considers only existing conditions. If the proposed dam changes conditions, then the criteria should be reconsidered.

- (2) If more than one sample per day is examined, the limit shall be the daily average. If only one sample per day is taken, the single value shall govern.

TABLE 6

CRITERIA

WOLF LAKE

Control Point - Illinois-Indiana State Line-Wolf Lake Culvert⁽¹⁾

Bacteria - Number per 100 ml by MF Techniques (Tentative) (2)

- a) The number of bacteria shall be the Arithmetic Average of the last five consecutive sample results.
- b) Satisfactory area if MF Coliform are less than 1000 and MF Fecal Streptococci are less than 100.
- c) Satisfactory area if MF Coliforms are from 1000 to 5000 and MF Fecal Streptococci are less than 20.
- d) A single sample result of over 100,000 Coliforms shall require immediate investigation as to the cause. Items to be considered in the judgment of cause and action to be taken include the sanitary survey, winds, currents and weather conditions.

Turbidity

No turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of water.

True Color - Units

Annual Average	Not more than 5
Single Daily Value or Average	Not more than 15

Odor

No obnoxious odor of other than natural origin

Temperature - °F

Not more than 85

Oil

Substantially free of visible floating oil.

Floating Solids and Debris

Substantially free of floating solids and debris from other than natural sources.

Bottom Deposits

Substantially free of muck and debris of other than natural origin.

CRITERIA (CONT'D)

WOLF LAKE

pH - Units

Daily Median

Within range 7.0 - 9.0

Dissolved Oxygen - Per Cent Saturation

Annual Average

Not less than 90

Single Value

Not less than 80

Ammonia Nitrogen (N) - mg/l (Tentative) (3)

Annual Average

Not more than 0.05

Single Daily Value or Average

Not more than 0.12

Methylene Blue Active Substance - mg/l

Annual Average

Not more than 0.02

Single Daily Value or Average

Not more than 0.05

Cyanides (CN) - mg/l

Single Value

Not more than 0.025

Total Phosphates (PO₄) - mg/l (Tentative) (4)

Annual Average

Not more than 0.03

Single Daily Average or Value

Not more than 0.04

- (1) Criteria apply at beaches as well as at Toll Road Bridge Station
- (2) Pending evaluation of data on bathing beaches during 1965 which are now being collected.
- (3) Pending study of additional data and evaluation of potential reductions at the sources.
- (4) Pending thorough determination of existing concentrations in Lower Lake Michigan Conference Area. Lower limits may be desirable.

If more than one sample per day is examined, the limit shall be the daily average. If only one sample per day is taken, the single value shall govern.

Francis Kittrell

PROCEDURES FOR APPLICATION OF CRITERIA

CONTROL POINTS

The committee recommends that the following sampling stations serve as control points to judge compliance with the recommended criteria. This recommendation is not intended to exclude sampling at such other points as may be found necessary to ensure effective pollution abatement and continuing monitoring and control of pollution.

OPEN WATER

1. Chicago South District Filtration Plant - Dunne or Shore Intake Crib, or both in combination
2. Gary Water Intake, West.

INNER HARBOR BASINS

1. Hammond Water Intake.
2. East Chicago Water Intake.

SHORE WATER

Existing sampling points at bathing beaches.

LITTLE CALUMET RIVER

Wentworth Avenue Bridge.

GRAND CALUMET RIVER

Baltimore and Ohio Chicago Terminal Railroad Bridge.

WOLF LAKE

Culvert through Earthen Dike Road on Illinois-Indiana State line.

Francis Kittrell

LABORATORY METHODS

Analytical methods shall adhere to the procedures approved by the Laboratory Directors representing the Illinois and Indiana pollution control agencies, the Metropolitan Sanitary District of Greater Chicago, the Chicago Bureau of Water and the Great Lakes-Illinois River Basins (GLIRB) Project.

The technical committee is aware of the variations in the procedures followed in determination of threshold odor by the several laboratories involved and none adheres to "Standard Methods," and recognizes that quantitative values reported by the laboratories quite probably have little true relationship to each other. In order to place threshold odor results on a comparable basis until a uniform procedure can be adopted, the committee recommends that all official determinations be performed by one organization, such as the Chicago South District Filtration Plant. In this way the South District Filtration Plant method would serve temporarily as a standard for reference procedure.

Recent discovery of wide variations in ammonia results obtained by four laboratories on two samples has cast some doubt on the comparability of analytical results. The program of the Laboratory Directors to achieve uniformity in methods and results should be pressed with all possible speed.

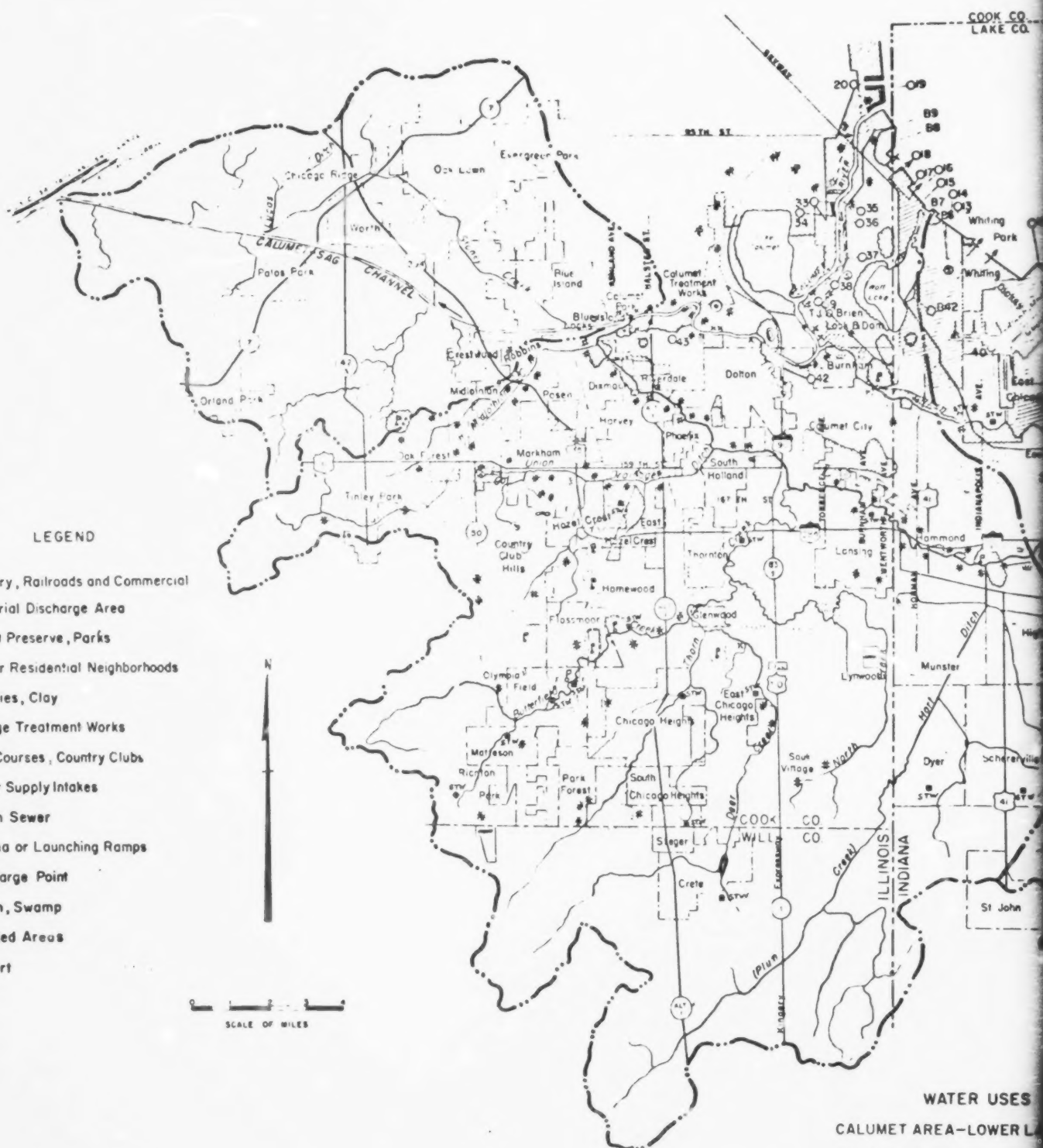
APPENDIX



LEGEND

-  Industry, Railroads and Commercial
-  Industrial Discharge Area
-  Forest Preserve, Parks
-  Center Residential Neighborhoods
-  Quarries, Clay
-  Sewage Treatment Works
-  Golf Courses, Country Clubs
-  Water Supply Intakes
-  Storm Sewer
-  Marina or Launching Ramps
-  Discharge Point
-  Marsh, Swamp
-  Wooded Areas
-  Airport

0 1 2 3
SCALE OF MILES



WATER USES

CALUMET AREA—LOWER LAKE
Illinois—Indiana Interstate Compact

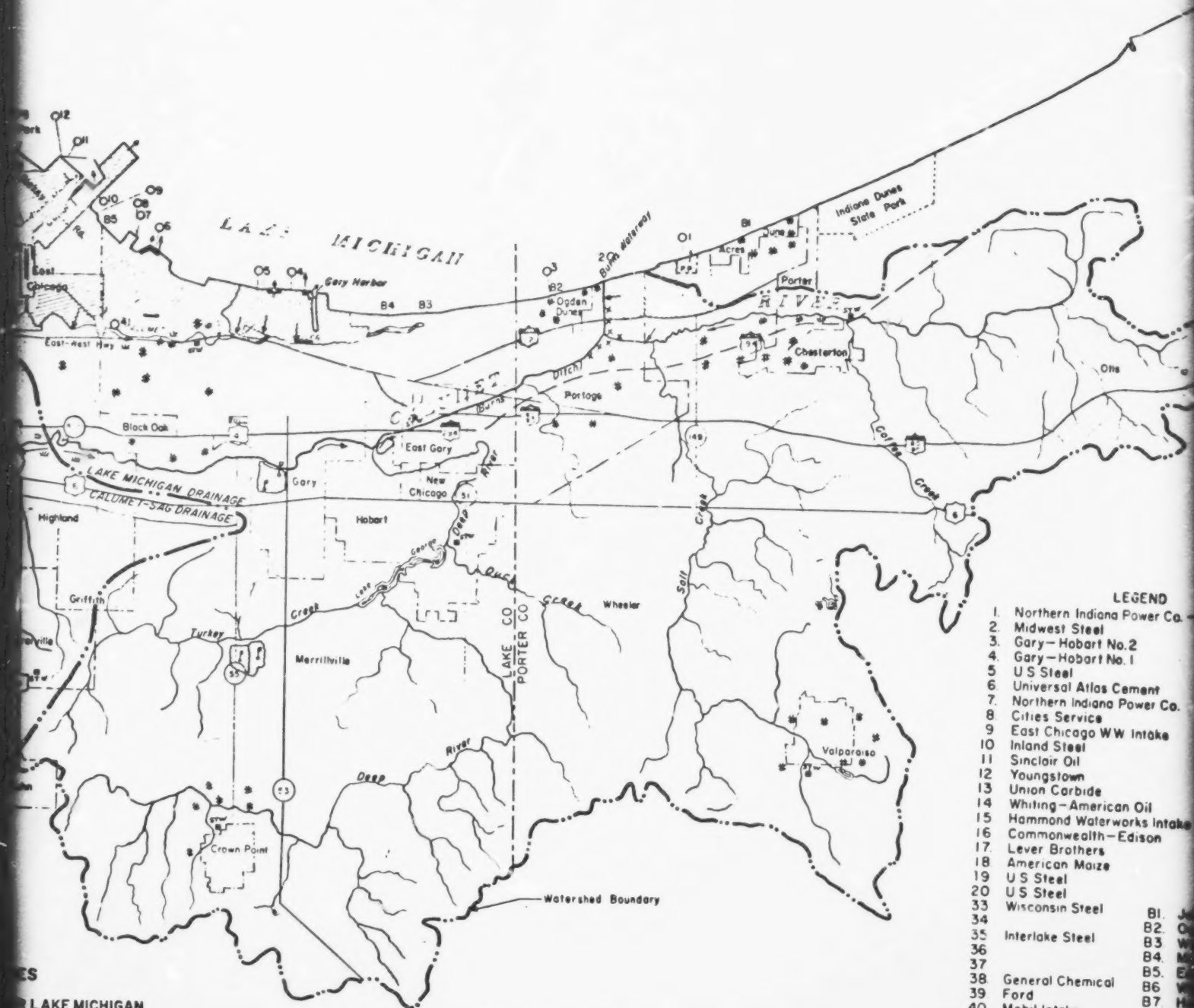
Prepared for Technical Committee on
The U.S. Dept. of Health, Education and Welfare
Water Pollution Control, Chicago, Illinois

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ILLINOIS
INDIANA

BERRIEN CO.
PORTER CO.

MICHIGAN
INDIANA



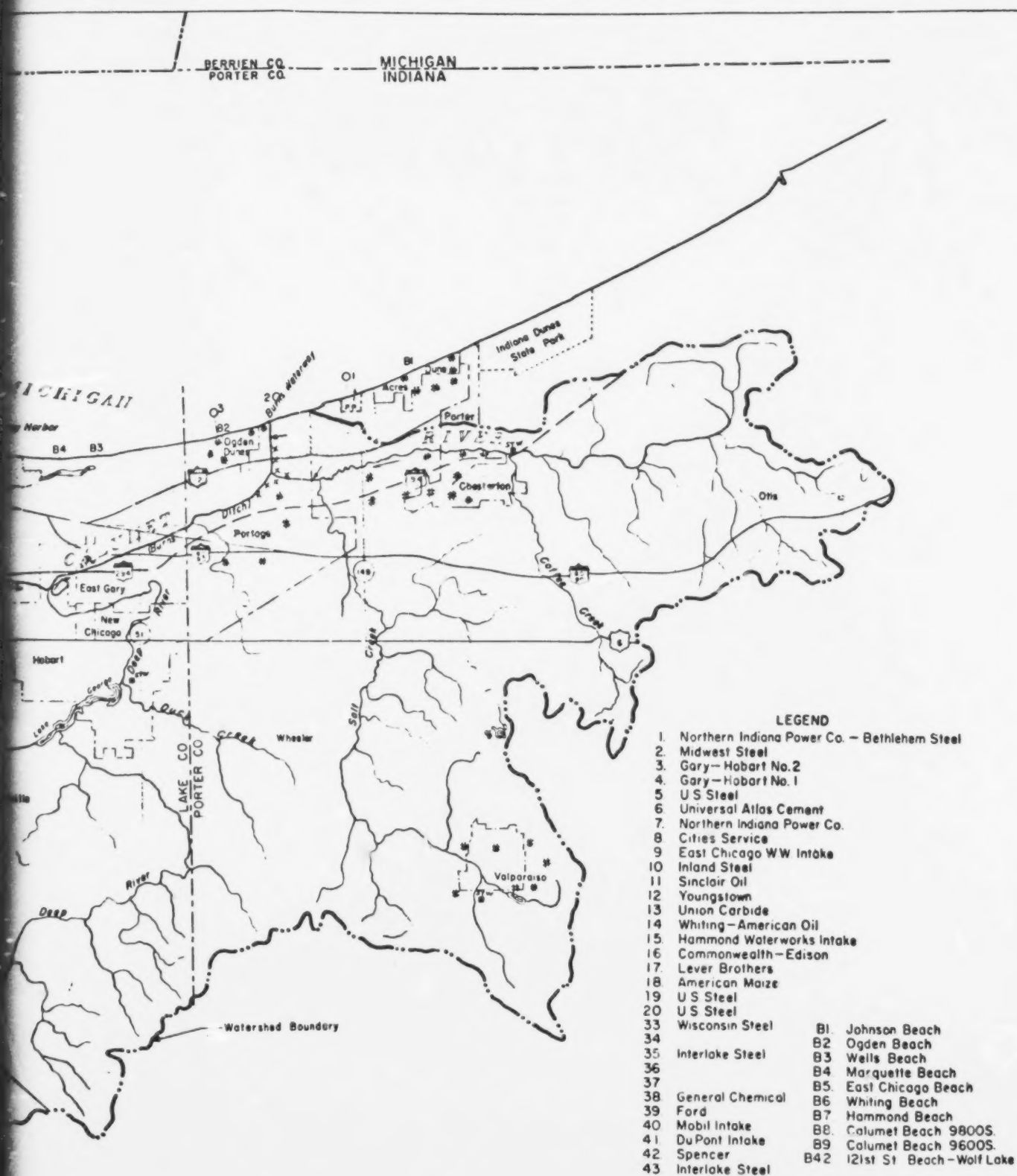
LEGEND

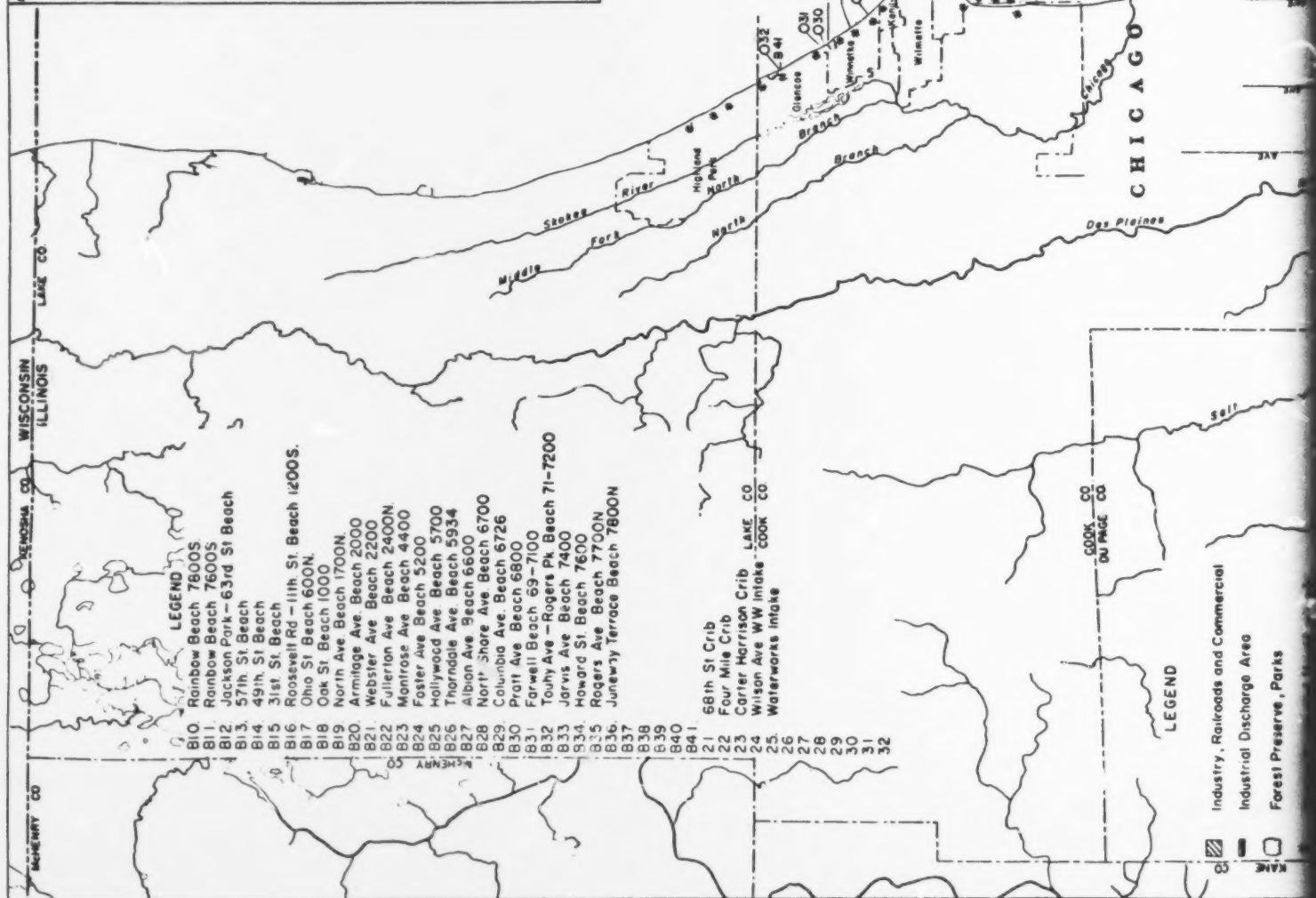
1. Northern Indiana Power Co.
2. Midwest Steel
3. Gary-Hobart No. 2
4. Gary-Hobart No. 1
5. U S Steel
6. Universal Atlas Cement
7. Northern Indiana Power Co.
8. Cities Service
9. East Chicago WW Intake
10. Inland Steel
11. Sinclair Oil
12. Youngstown
13. Union Carbide
14. Whiting-American Oil
15. Hammond Waterworks Intake
16. Commonwealth-Edison
17. Lever Brothers
18. American Maize
19. U S Steel
20. U S Steel
33. Wisconsin Steel
34. Interlake Steel
35. Interlake Steel
36. Interlake Steel
37. Interlake Steel
38. General Chemical
39. Ford
40. Mobil Intake
41. DuPont Intake
42. Spencer
43. Interlake Steel

Bl. J
82. O
83. W
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ES
LAKE MICHIGAN
Conference Region

on Water Quality
Enforcement Conference on





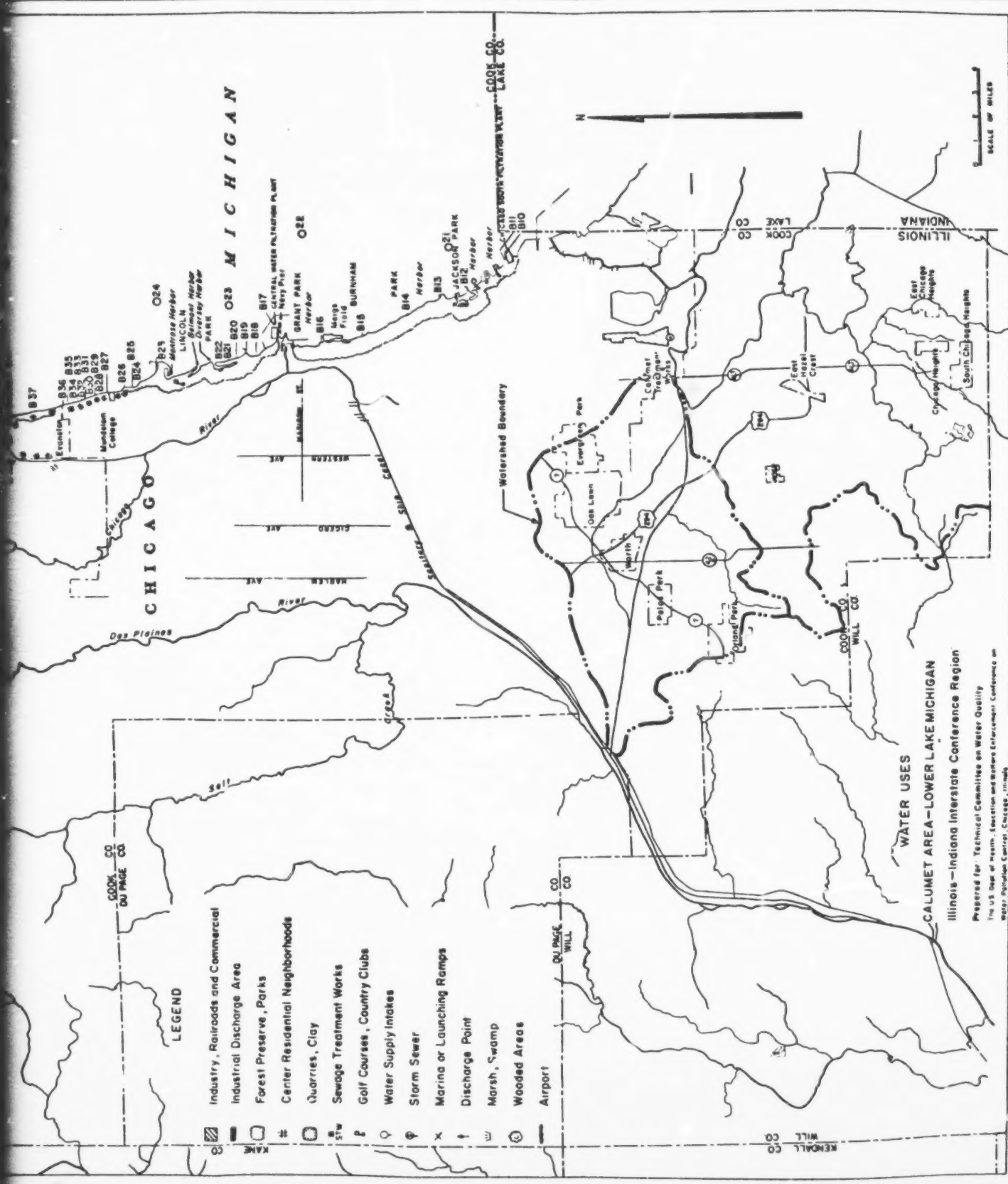


TABLE II

CONSTITUENTS	USES							
	Municipal Water	Industrial Water - Processing	Industrial Water - Cooling	Recreation - Whole Body Contact	Recreation - Limited Body Contact	Fish and Wildlife	Commercial Shipping	Esthetics
Open Lake and Inner Harbor Basins								
Coliform Bacteria	X				X			
Fecal Streptococcus	X				X			
Turbidity		X	X			X		X
Color (True)	X	X						X
Threshold Odor Number	X							
Odor					X			X
Temperature		X	X			X		
Oil					X	X	X	X
Floating Solids and Debris					X		X	X
Bottom Deposits						X		
pH	X	X	X		X	X	X	
Dissolved Oxygen	X	X			X	X		
BOD								X
Ammonia Nitrogen	X	X				X		
Nitrogen (Total)								X
Meth. Blue Act. Substance	X	X			X	X		X
Chloride	X	X						
Cyanide	X					X		
Fluoride	X							
Dissolved Iron	X							
Phenol-Like Substances	X	X				X		
Sulfates	X							
Phosphates (Total)	X							X
Filtrable Residue(Tot.D'd Solids)	X	X						
Misc. Trace Contaminants	X					X		
Radionuclides	X					X		

TABLE III

CONSTITUENTS	USES							
	Municipal Water	Industrial Water - Processing	Industrial Water - Cooling	Recreation - Whole Body Contact	Recreation - Limited Body Contact	Fish and Wildlife	Commercial Shipping	Wastewater Assimilation
Shore Water								
Coliform Bacteria				X	X			
Fecal Streptococcus				X	X			
Turbidity				X				
Color (True)				X		X	X	
Threshold Odor Number				X			X	
Odor				X	X		X	
Temperature				X		X		X
Oil				X	X	X	X	
Floating Solids and Debris				X	X		X	
Bottom Deposits				X		X		
pH				X	X	X		X
Dissolved Oxygen				X	X	X		X
BOD								X
Ammonia Nitrogen						X		
Nitrogen (Total)							X	
Meth. Blue Act. Substance				X	X	X	X	
Chloride								
Cyanide				X		X		
Fluoride								
Dissolved Iron								
Phenol-Like Substances						X		
Sulfates								
Phosphates (Total)							X	
Filtrable Residue(Tot.D'd Solids)								
Misc. Trace Contaminants						X		
Radionuclides						X		

TABLE IV

CONSTITUENTS	USES								
	Municipal Water	Industrial Water - Processing	Industrial Water - Cooling	Recreation - Whole Body Contact	Recreation - Limited Body Contact	Fish and Wildlife	Commercial Shipping	Esthetics	Wastewater Assimilation
Little Calumet River From State Line to Junction With Calumet Sag. Channel									
Coliform Bacteria					X				
Fecal Streptococcus					X				
Turbidity						X		X	
Color (True)								X	
Threshold Odor Number								X	
Odor					X			X	
Temperature						X			X
Oil					X	X		X	
Floating Solids and Debris					X			X	
Bottom Deposits						X			
pH					X	X			X
Dissolved Oxygen					X	X			X
BOD									X
Ammonia Nitrogen						X			
Nitrogen (Total)								X	
Meth. Blue Act. Substance					X	X		X	
Chloride									
Cyanide						X			
Fluoride									
Dissolved Iron									
Phenol-Like Substances						X			
Sulfates									
Phosphates (Total)								X	
Filtrable Residue(Tot. D'd Solids									
Mics. Trace Contaminants						X			
Radionuclides						X			

TABLE V

CONSTITUENTS	USES							
	Municipal Water	Industrial Water - Processing	Industrial Water - Cooling	Recreation - Whole Body Contact	Recreation - Limited Body Contact	Fish and Wildlife	Commercial Fishing	Wastewater Assimilation
Grand Calumet River State Line to Junction with Calumet River								
Coliform Bacteria								
Fecal Streptococcus								
Turbidity		X	X				X	
Color (True)		X					X	
Threshold Odor Number								
Odor							X	
Temperature		X	X					X
Oil							X	
Floating Solids and Debris							X	
Bottom Deposits							X	
pH		X	X					X
Dissolved Oxygen		X						X
BOD								X
Ammonia Nitrogen		X					X	
Nitrogen (Total)							X	
Meth. Blue Act. Substance		X						
Chloride		X						
Cyanide								
Fluoride								
Dissolved Iron								
Phenol-Like Substances		X						
Sulfates								
Phosphates (Total)							X	
Filtrable Residue (Tot. D'd Solids)		X						
Misc. Trace Contaminants								
Radionuclides								

TABLE VI

CONSTITUENTS	USES							
	Municipal Water	Industrial Water - Processing	Industrial water - Cooling	Recreation - Whole Body Contact	Recreation - Limited Body Contact	Fish and Wildlife	Commercial Shipping	Esthetics
Coliform Bacteria				X	X			
Fecal Streptococcus				X	X			
Turbidity				X		X		X
Color (True)				X				X
Threshold Odor Number								
Odor				X	X			X
Temperature				X		X		X
Oil				X	X	X		X
Floating Solids and Debris				X	X			X
Bottom Deposits				X		X		
pH				X	X	X		X
Dissolved Oxygen				X	X	X		X
BOD								X
Ammonia Nitrogen						X		
Nitrogen (Total)								X
Meth. Blue Act. Substance				X	X	X		X
Chloride								
Cyanide				X		X		
Fluoride								
Dissolved Iron								
Phenol-Like Substances						X		
Sulfates								
Phosphates (Total)								X
Filtrable Residue (Tot. D'd Solids)								
Misc. Trace Contaminants						X		
Radionuclides						X		

Francis Kittrell

My summary is as follows:

Following the first session of the Enforcement Conference on pollution of interstate waters of the Calumet Area and Lower Lake Michigan in early March, the conferees appointed a technical committee to "evaluate water quality criteria and related matters in the area covered by the conference and to make recommendations to the conferees within six months after the issuance of this summary of the Conference."

The technical committee was appointed and organized for its first meeting on April 7. It held 14 meetings, covering a total of 25 days, at approximately two weekly intervals from that date until agreement was reached on a final report.

The committee had eight members, with alternates who served when the regular members could not be present. Four of the members represented pollution control agencies. As chairman, I represented the U. S. Department of Health, Education, and Welfare. Dr. Joel Kaplovsky represented the Metropolitan Sanitary District of Greater Chicago, Mr. Perry Miller the Indiana Stream Pollution Control Board, and Mr. Richard Nelle the Illinois Sanitary Water Board. Mr. Harold Jordahl, regional coordinator, represented all interests of the Interior Department, including recreation and fishing. Two members, Dr. Charles Bishop of the U. S. Steel Corporation

Francis Kittrell

and Mr. Russell Mallatt of the American Oil Company, represented the industrial interests. Mr. Hyman Gerstein, of the City of Chicago Department of Water and Sewers, an internationally recognized authority on water treatment, completed the committee.

All of these men and their alternates took their assignments very seriously, and this was a real working committee with which it was truly a pleasure to be associated. I want to take this opportunity to express publicly my appreciation to each of them for their faithful and thoughtful participation in our extended and sometimes exhausting deliberations.

This committee was faced with a complex problem indeed. We were dealing with bodies of water that varied widely -- the relatively small Wolf Lake which straddles the Indiana-Illinois State line, the Calumet Area streams which flow sometimes in one direction and sometimes the other and even on occasion flow not at all except for the treated sewage which constitutes their only source of water, and a portion of Lake Michigan, one of the largest bodies of fresh water in the world.

We were dealing with varied effects of waste on water quality that included: Offense to the esthetic sensibilities of those who would enjoy a stroll by clean, clear

Francis Kittrell

waters; undesirable changes in the teeming aquatic life, including fish, of the lake and the streams; hazards to the health of some fraction of those hundreds of thousands who swarm to the lake beaches during the summer; and the discomfort of those whose drinking water from time to time has a most offensive chemical odor or taste.

We were dealing with some factors that were well known and well defined, and with others that were obscure and ill defined.

We were charged with the responsibility of recommending water quality criteria that would ensure protection of these priceless water resources for all present and future uses without unduly penalizing existing municipalities and industries that must treat their wastes, and without restricting future population and industrial growth of the area.

Among the earliest considerations of the committee was the proper interpretation of the word "criteria." A long-standing favorite subject for discussion by that portion of the sanitary engineering profession that deals with stream sanitation is the definitions of the various words that describe limits on water quality. Among the most commonly used words are "criteria," "goals," "objectives," "requirements" and "standards."

The word "criteria" implies that the proposed limits

Francis Kittrell

are to be used as guides in judging the suitability of water quality for various uses. The words "goals" and "objectives" imply that the limits are aims toward which corrective action will be directed. Both requirements and standards establish limits that must be met. The important differences among the several definitions involve the flexibility of application of the limits, ranging from the highly flexible criteria to the quite rigid standards.

In view of the complexity of the situation, the committee felt that it was desirable to retain flexibility in application of criteria in the program of corrective action that is to be undertaken, at least until the practicality of the recommended water quality limits has been proven by experience. However, the final decision regarding the application of the criteria is, of course, a proper function of the conferees.

Among other early decisions of the committee were that: The criteria to be developed should be based on present and potential water uses; the present high quality of water in certain portions of the lake should be preserved in so far as is feasible; improvement in water quality is necessary in other areas; and water quality criteria adopted at this time should be reviewed from time to time and revised as necessary. The committee makes no claim to the prophetic

Francis Kittrell

vision that would be required to establish criteria for all time to come.

A wealth of water quality data and of practical experience with the water use problems of the area was available to the committee. Five of its eight members had had personal experience with one or more facets of the area problems.

Probably the single most useful combination of technical data and experience was that available from the City of Chicago South District Filtration Plant through one of the committee members, Mr. Gerstein. The voluminous operating records of this plant provided a comprehensive picture of water quality at the plant water intakes and the experiences of the operating personnel revealed the levels of pollutants at which difficulties in water treatment occurred.

Based on these factors, Mr. Gerstein had proposed certain limits on pollutorial constituents at the first session of the conference. In addition, plant personnel have conducted a regular program of lake and stream sampling in the area at many points with which the committee was concerned.

Thus the South District plant not only provided an excellent starting point for the selection of sound criteria at the plant water intakes, but also furnished a

Francis Kittrell

basis, through the regular sampling program, for intelligent correlation of the criteria selected for the South District water intakes with those for other points of concern in the lake.

The committee soon realized that it would not be feasible to achieve uniform water quality throughout the area and that a single set of criteria for all points in the area would not be practical.

For example, some water plant intakes, such as those for Hammond, Whiting and East Chicago, are relatively close to the lake shore and to sources of wastes that discharge to the lake, and are at locations where dilution of wastes by clean lake water is restricted by breakwaters such as those at Calumet and Indiana harbors. Other intakes, such as those for Chicago and Gary, are more remote from sources of wastes and are in open-water locations where more dilution with clean lake water occurs.

It obviously is not reasonable to expect to achieve the same high quality of water at the inshore intakes that it is possible to attain at the open-water intakes. The committee concluded that it would be poor policy, indeed, to accept lowered water quality at the open water intakes simply because it would not be practical to ensure the same high quality at the inshore intakes that is possible in the

Francis Kittrell

open water. Similar differences in practicality of attainment of water quality exist with respect to other water uses and to other locations.

Consequently, the committee established three zones for the lake waters of the area. One zone, designated as Open Water, includes all of the area more than 200 yards offshore and outside of a line from the outer end of the Calumet Harbor Breakwater to and along the Inland Steel Bulkhead line and thence through the U. S. Steel water supply intake to the outer end of the Gary Harbor Breakwater.

A second zone, designated as the Inner Harbor Basins, is the area shoreward of the above line, but not including shore water. Shore Water is all water within 200 yards of shore except in the Inner Harbor Basins, where it is that water within 200 yards of existing recreational areas. In addition to the three lake zones, the committee considered the three interstate portions of the Little Calumet and the Grand Calumet Rivers and of Wolf Lake.

In each of the six areas, the committee considered existing and potential water uses. The seven types of water uses considered were municipal water supply, industrial water supply, recreation, fish and wildlife, commercial shipping, esthetics and waste water assimilation.

For the six areas the committee considered a total

Francis Kittrell

of 31 sets of criteria consisting of 18 to 51 items for each area. Its final report recommends limits on nearly 200 items involved in water quality in the six areas under consideration.

It would be needlessly time-consuming to plod through all of these 200 items at this time. The six tables will be included in the transcript of the "Report on Water Quality Criteria, Calumet Area - Lower Lake Michigan." Only some of the more significant items will be discussed here.

Major emphasis must be placed on protection of public health, both of those who are served by municipal water supplies and those who use the area's beaches. For protection of water consumers against disease, we have recommended limits of coliform bacteria not to exceed an annual average of 200 per 100 ml, with no single day's value in excess of 2,500 per 100 ml. for Open Water, and corresponding limits of 2,000 and 5,000 per 100 ml. for the Inner Harbor Basins. Recommended tentative limits on fecal Streptococci are 25 per 100 ml. for Open Water and 100 per 100 ml. for the Inner Harbor Basins. For bathing beaches in Shore Water, the quality is to be considered satisfactory if coliform bacteria are less than 1,000 and Streptococci are less than 100 per 100 ml., or if coliforms are between 1,000 and 5,000 but Streptococci are less than 20 per 100 ml. In addition, toxic materials at water supply intakes shall not exceed concentrations that would pre-

Francis Kittrell

vent meeting Public Health Service Drinking Water Standards after conventional treatment.

Closely following protection of public health in importance is the preservation of esthetic values. Those include prevention of taste and odor in public water supplies and of objectional visual pollution, especially in beach areas. It is recommended that threshold odor number of a chemical nature not exceed an annual average of 4, nor a single day's value of 8 in Open Water, and that corresponding values for Inner Harbor Basins not exceed 8 and 20. Phenol-like substances should not exceed an annual average of one part per billion (ppb) or a single day's value of 3 ppb in Open Water, and be not more than 2 ppb and 5 ppb in the Inner Harbor Basins. To preserve esthetic values for both Open Water and Shore Water, the waters should be substantially free of floating oils and of solids and debris from other than natural sources and there should be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of the water.

To prevent undue interference with and cost of water treatment, it is recommended that ammonia not exceed an annual average of 0.02 milligrams per liter (mg/l) or a single day's value of 0.05 mg/l in Open Water, and be not more than 0.05 and 0.12 mg/l in the Inner Harbor Basins.

Francis Kittrell

Protection of fish and other aquatic life is covered by several limitations. Dissolved oxygen should not be less than 90 per cent of saturation for an annual average nor less than 80 per cent saturation for a single day in Open Water with corresponding limits of 80 and 65 per cent of saturation for the Inner Harbor Basins. The hydrogen ion concentration of pH is to be limited to an annual median within the narrow range of 8.1 to 8.4, and a daily median within the range of 7.7 to 9.0 in Open Water, to corresponding ranges of 8.0 to 8.5 and 7.5 to 9.0 in the Inner Harbor Basins, and to 7.0 to 9.0 in Shore Water. Cyanides are to be limited to 0.025 mg/l in Open and Shore Waters and to 0.1 mg/l in the Inner Harbor Basins. General prohibitions of materials that will adversely affect the physical, chemical or biological nature of the bottom in Open Water are recommended.

Many other limitations are recommended, but the selected values cited indicate the exceptionally high quality of water that the committee believes is obtainable and desirable in Lower Lake Michigan. If these recommendations are adopted by the conferees, it is believed that they will be establishing a precedent in seeking the highest quality of water that is feasible. Improvements in sewage treatment facilities and practices already in effect or in prospect and estimated reductions of 70 to 80 per cent in the more

Francis Kittrell

objectionable industrial waste constituents should go far toward meeting these criteria.

Criteria recommended for Wolf Lake are designed to ensure the same protection for bathers as for those in Shore Water, and the same protection for fish as in Open and Shore Waters.

The Little Calumet and Grand Calumet Rivers present quite different problems than those encountered in the lakes. Here much of the flow is waste treatment plant effluent with little natural dilution, and, in fact, such effluent is the only flow in the Grand Calumet at times. The criteria recommended for these streams are believed to be the highest that can be achieved by conventional sewage treatment, but as improved waste treatment methods become available these criteria should be re-evaluated.

Those presently recommended for the Little Calumet River should permit safe use for limited body contact recreation, such as boating and fishing, for wildlife and rough fish, and for waste water assimilation, and should prevent nuisances. Those for the Grand Calumet should permit use for industrial water supply and waste water assimilation, and should prevent nuisances.

MR. STEIN: Thank you, Mr. Kittrell.

Are there any comments or questions?

Francis Kittrell

As you know, we told you this was going to be a technical session of the conference. I think you can appreciate the difficult nature of what this technical committee has done, but I suspect that these numbers and what we are going through and arriving at probably represent the future face of pollution control. I don't think any of us believe without any numbers similar to this that we are going to have the criteria, standards, and requirements if you will, to judge if we are going to have pollution control.

I would like to say for this committee that as far as I can see this is to my mind a culmination of 20 years of work and a program on various levels and with industry. I am not sure that ten or even perhaps five or even perhaps two years ago we could have gotten all of these diverse elements together, industry, local government, State government, and Federal government, to come up with an agreed-upon set of numbers the way we have had here.

I do think that it would be fair to say -- and, of course, the conferees will consider these numbers -- that the reflection or the attainment of the water quality recommended by the technical committee would indeed give us a rather good quality of water in the Great Lakes or in the tributaries covered by the conference. Certainly if all the waters in the country had this quality there would be no pollution

Francis Kittrell

problem in the country.

Now, the 200 items are covered in a little brochure which has been prepared for distribution. We have only a limited number of these copies at the present time. There are 13 pages of rather close typing. For those who are interested these can be picked up.

I suspect this very well may become a historic document, because I think something like this will have to be forthcoming in most areas of the country if we are going to achieve water pollution control.

Mr. Kittrell, I would like to extend our thanks to the technical committee for a really pioneering effort, I think, in the field of water pollution control.

I don't know where these criteria and standards are going to lead, and I don't know what the position of the conferees will be after they consider them and evaluate them. But I think right now it is safe to say that we have moved farther along in the field of pollution control in arriving at a consensus involving municipalities, districts, State and Federal government, and a consensus on specifics than I have ever seen in this field.

Thank you very much indeed, Mr. Kittrell.

Mr. Klassen.

MR. KLASSEN: Mr. Stein, I would like to have you

Francis Kittrell

draw on your own experience. I have stated this, but I just want it confirmed or not confirmed. This is the first time that representatives of two States and the Federal government under the so-called aegis of legality have come up with agreed upon standards. Is this correct?

MR. STEIN: That is correct, sir. They have come up with a relatively high quality of water.

I might say you can appreciate if you read these 200 items and look at Mr. Kittrell's full report this is even to be more admired because of the complexity of the problem.

It is amazing, it seems to me, that we have come up with these standards in one of the most difficult areas of the country. I think the reason we have come up with this is two-fold. We just had to do it. Perhaps the easy areas do not call for this. The second point is we had, as far as I can see, the complete cooperation, goodwill and hard work of the various members of the technical committee.

I don't know how many people are thoroughly conversant with our field, but as this was going on I looked over the names of the technical committee here, and I would say wherever you would have a technical committee you would be hard put, if you had the whole country to choose from, to select a more distinguished and expert technical committee than devised these requirements.

Francis Kittrell

Again, I would like to say that this reflects very favorably on the two States and the Sanitary District that from their own staff they were able to supply men of this caliber.

I would also like to commend the oil industry and the steel industry for sending top experts to the technical committee. I think we have had very, very distinguished industrial waste experts and experts in dealing with the technical aspects of public programs. This is what has led to this achievement.

MR. KLASSEN: Just one other thing. We have enough worries and problems right here in Lake Michigan, but would you want to venture a guess that this might be seriously considered in other parts of the Great Lakes?

MR. STEIN: I would not like to prejudge that. I would think that is true not only in other parts of the Great Lakes, but I do think we have a model here which cannot only be used for the Great Lakes but for the rest of the country.

As you know, we are faced with the statutory problem of developing Federal standards, and the State agencies have the first obligation to come up with these standards.

The conferees will go through these and whatever modifications may be made. The pattern of the development of these standards had become evident here. I think that

Francis Kittrell

probably this is the indication of the wave of the future.

As far as I can see, we are years ahead, at least in administrative techniques, of the rest of the country. I am sure that when the committee gets through its deliberations and the conferees come up with their conclusions, whatever they adopt, the entire proceedings and the requirements developed by the committee as discussed and considered and possibly adopted by the conferees will be one of the most sought after documents in the field.

Are there any further comments or questions?

(No response.)

If not, thank you very much, Mr. Kittrell.

MR. POSTON: At this time I would like to call Grover Cook to come back and make a report on Federal installations and give us general recommendations.

Grover Cook
FURTHER STATEMENT

OF

GROVER COOK, CHIEF, ENFORCEMENT ACTIVITIES,
REGION V, FEDERAL WATER POLLUTION CONTROL
ADMINISTRATION

Federal Activities

Besides the surveillance activity, the Department of Health, Education, and Welfare recognized a responsibility for abatement of pollution at Federal installations. There are no large Federal pollution sources in the conference area, but the Department contacted all possible polluters shortly after the conference to evaluate their problems. Four Army Nike sites are located in the conference area. Their problems were largely one of poor maintenance and operation. The Army has since thoroughly reviewed their waste treatment practices, and has initiated a program that will prevent future pollution.

The Coast Guard tells us they will start construction of all necessary waste treatment facilities in the conference area -- in fact, throughout the Great Lakes -- in the spring of 1966, to be completed during the fiscal year of 1967. Many of these will be completed by the end of calendar year 1966.

In addition, the Department of Health, Education,

Grover Cook

and Welfare is installing six macerator-chlorinator units, which are vessel waste treatment devices, in several Coast Guard vessels in this area, to be evaluated. Hopefully, then, the other Federal vessels can follow suit and profit by this experience.

In addition to Federal water pollution control activities of this nature, the Department of Health, Education, and Welfare has also assisted the pollution control effort by making grants for construction of municipal waste treatment facilities in the area. Since January, 1965 four grant offers were made. The largest was to the Metropolitan Sanitary District of Greater Chicago in the amount of \$1,041,000 for construction amounting to \$3,650,000. Grant offers totalled \$1,593,000 for \$4,373,000 of construction in the conference area. Before the conference the Department of Health, Education, and Welfare made grants of about \$2-1/2 million to 11 communities.

Recommendations

The Department of Health, Education, and Welfare reaffirms its position in regard to the conclusions and recommendations of the March 1965 conference. Surveillance activities over the past eight months have pointed up the need for a very vigorous program. Therefore it is suggested that the conferees consider the following recommendations.

Grover Cook

It is recommended that:

1. Present surveillance activities be expanded to include more sampling stations and more frequent sampling.

The industries, municipalities, and the regulatory agencies are encouraged to cooperate with the current Department of Health, Education, and Welfare's Surveillance Program in the establishment of a more comprehensive program, including the possible installation of automatic monitoring equipment to augment the present Department of Health, Education, and Welfare's monitors.

2. Laboratories continue to work together in a long-range program to obtain uniformity in methods and precision of results. Industrial, municipal, and regulatory agency laboratories are invited to cooperate with the Department in this program.

3. Information on characteristics of effluents and receiving waters, and new construction of waste treatment facilities be made available to the Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board, and the Metropolitan Sanitary District of Greater Chicago for compilation in semi-annual status reports to the conferees and to the Secretary of Health, Education, and Welfare.

That's all I have.

MR. STEIN: Thank you, Mr. Cook.

Grover Cook

Are there any comments or questions?

I would like to bring one point out that Mr. Cook raised of possible interest to the outdoors people, the conservation groups who may be in the audience.

We have had a marine toilet operating on our boat in Raritan Bay, between New York and New Jersey, for about a year and have found it very satisfactory.

As you know, in the last few years we have been conducting assiduous searches for effective marine toilets to stop pollution from boats.

On the basis of this we have made available \$75,000 for a cooperative program with the Coast Guard where marine toilets will be put into operation on the Coast Guard boats operating in New York Harbor, Raritan Bay, and the Great Lakes. This shows you we just don't always enforce and use money to tell people what to do but try to put our money where our mouth is sometimes.

We hope this demonstration will show what can be done with wastes from ships, and we hope that it will be closely watched and may prove an example to others so that you can employ similar programs in your own localities and in your States and use this measure to protect the lakes and streams wherever they may be.

Are there any further comments or questions?

Grover Cook

(No response.)

If not, thank you very much.

MR. POSTON: That concludes our particular part of this program, and we would like now to call upon Commander Waite of the U.S. Navy who has a prepared statement on the progress of the Navy in this matter of pollution.

MR. STEIN: If I had known we were to have a Navy man, I probably should have said "ship" instead of "boat."

(Laughter)

Commander Charles E. Waite

STATEMENT OF

LIEUTENANT COMMANDER CHARLES E. WAITE,

U. S. NAVY

COMMANDER WAITE: Mr. Chairman, fellow members of the effluent society: (Laughter)

At this time I would like to take the opportunity to thank the committee for inviting the Navy to make this public statement as to the programs and steps that the Navy has taken to help in the abatement of water pollution.

Before reading my statement, which I assure you is very short, I would like to say at the outset that upon notification that there was pollution by the Navy we took what we considered to be a rather legalistic approach, and then upon looking into the problem a little more closely, recognizing that the Federal government is really the impetus behind the whole program, we became more enlightened.

We do have two problems here in the Chicago Sanitary District Area. One is with the Randolph Street Armory, which is not owned by the Navy but is used by the Navy, and also with our vessel that is tied up at the Randolph Street Armory.

Now, if you will, bear with me for a moment while I go through a reading exercise.

In May 1965, the Chicago office of the Department of Health, Education, and Welfare, in a letter to the

Commander Charles E. Waite

Commandant, Ninth Naval District, indicated that the Navy was not providing treatment of waste waters from its vessels stationed or operating in the Chicago area pursuant to the requirements of the municipal code of the City of Chicago.

Now, here is where we took our legalistic approach. In response, it was pointed out that the Chicago municipal code did not apply to public vessels of the United States government, and further that the naval vessels operating in this area were complying with the more stringent requirements of the Federal statute (33 USC 421) which has application on the Great Lakes.

On 7 July 1965, the Metropolitan Sanitary District of Greater Chicago in correspondence to the Commandant, Ninth Naval District, stated that "vessels docked at the Naval Armory (Randolph Street) are discharging wastes into Lake Michigan that violate our 1946 ordinance for the control and abatement of pollution of water within our jurisdiction."

On 5 August 1965 the Chicago Sanitary District suggested a meeting to discuss the problem of waste disposal not only from the vessels docked at the Naval Armory, but also from the Armory itself. This was the first occasion that the Navy was asked officially to consider the Armory waste disposal problem as its responsibility.

Commander Charles E. Waite

At the outset of the meeting with the Sanitary District personnel, it was agreed that there were two distinct, albeit interrelated problems; that is, pollution from (1) Naval Armory and (2) Naval vessels.

Recognizing the intent of Congress as expressed in the Federal Water Pollution Control Act, as amended (33 USC 466 et seq.) the Navy representatives expressed the desire of the Navy to cooperate with all interests in so far as practicable and consistent with the interest of the United States and within the limits of available appropriations. In this spirit Navy representatives and officials of the State of Illinois, owner of the Randolph Street Naval Armory, met to discuss ways and means to abate the alleged pollution from the Armory's septic tanks. Since the United States does not have a proprietary interest in the Naval Armory building, the Navy cannot, under present regulations, expend Federal funds for capital improvements such as the construction of a sewer line from the Armory to the city sewerage system.

However, because of the emphasis placed upon the water pollution abatement program by the Federal government and because of the fact that the Navy is, for all intents and purposes, the sole user of the Naval Armory, the project for the construction of a sewer line, as mentioned above, has been included in the budget program of the Navy Bureau of

Commander Charles E. Waite

Yards and Docks. Whether the project will be authorized and funds appropriated is presently the subject of some speculation in view of the recently announced cutback of military construction programs because of the Vietnam conflict.

Meanwhile, Sanitary District engineers conducted tests of the effluent of the Naval Armory septic tanks in order to determine its degree of contamination. The results of these tests were reported by the Sanitary District as indicating "an unusually weak effluent."

On the basis of this information the Illinois authorities and Navy representatives, in a cooperative effort and as a temporary solution to the problem of pollution from the Armory, have initiated procedures for the installation of a system whereby the septic tank effluent would receive secondary treatment by way of chlorination prior to discharge into the waters of the Sanitary District. This procedure has been approved by the Chicago Sanitary District.

These are the steps which have been taken toward solving the Armory problem, and it is felt that the temporary solution is reasonable in view of the Sanitary District tests. The duration of this interim arrangement is indeterminate at this time because of requirements for Congressional authorization and the exigencies of the Southeast Asia military involvement.

Commander Charles E. Waite

The discharge of waste materials from Naval vessels has been a subject of study by the Department of the Navy for several years. The Navy anticipated the primary problem in early 1962 by incorporating in the piping design of new ships the provision for the separation of soil and human wastes. Backfitting of treatment equipment in these ships will be facilitated as a result of this action, but the effort and cost in backfitting ships built prior to 1962 will be considerable.

The Navy recognizes the importance of this problem, is proceeding in the knowledge that pollution from ships is definitely significant, and has recently expanded its efforts to seek a solution. The Secretary of the Navy recently stated that the public interest requires that the Navy take all feasible steps which will help minimize the water pollution problem which exists today.

At Navy initiation a macerator-chlorinator treatment unit has been developed for small ships which will be suitable for a maximum of about 40 people. It is planned that specifications for all new small ships and craft will provide for installation of this service-tested unit. Another step taken by the Navy has been its invitation to interested companies to bid on the development and design of a waste treatment system for larger ships. Following prototype

Commander Charles E. Waite

approval, specifications for future large ships will be amended to include a requirement for a waste treatment system.

With respect to USS PARLE (DE-708), which is stationed here at the Naval Armory, Randolph Street, as well as other Naval Training boats and ships, the following courses of action are contemplated:

- a) For ships under 40 complement, install a macerator-chlorinator unit, subject to availability of funds;
- b) for larger ships such as DE -- the PARLE -- install the large waste treatment unit which is expected to be available about July 1968; once again backfitting is dependent upon availability of funds. The principal problems associated with the installation of waste treatment systems in existing ships are centered in piping rearrangements, watertight integrity, and weight and space requirements.

In addition to the above, the Navy's Bureau of Ships has undertaken the development and manufacture of a prototype installation in PARLE which, it hopes, may then be applicable to other ships in the Great Lakes.

In conclusion it may be said, categorically, that the Navy has recognized the importance of the pollution problem. It is taking permanent long-term measures to abate

Commander Charles E. Waite

the pollution of the country's harbors, lakes and waterways, in general. Pending completion of these long-term solutions, the Navy is currently developing a waste treatment system for PARLE and, in cooperation with the State of Illinois, is installing equipment to provide adequate treatment of the Armory wastes.

Thank you.

MR. STEIN: Thank you, Commander.

Are there any comments or questions?

(No response.)

If not, thank you very much.

I might say for the audience we have worked with trying to install waste treatment facilities on ships that have been already built. This is one of the most vexing problems we have in our field, and I think the Commander will readily agree, particularly in a Naval ship made to carry out a specific mission. There just isn't an inch to spare.

The point is, if you have to change the piping arrangements this is not very simple. You can't even move them a foot without making adjustments, and once you do that you are in the situation sort of like musical chairs. You move one pipe, and every other one has to be moved.

The problem of installing adequate waste collection and disposal facilities on some of the older ships is indeed

Commander Charles E. Waite

formidable and expensive. Perhaps that is not so on the Naval ships, or maybe it is. But on many of the others, particularly some ships we have found with foreign registry, we have found waste discharges from ten or 12 points in the vessel.

Evidently a lot of these older ships were designed to get it in the waste pipe and right out as soon as possible and just let it go to the outside.

The task of running the pipe, connecting them all together, bringing them to one or two or three central points and treating it presents a real problem in ingenuity and engineering.

Commander, we are with you on the program and will try to do what we can to work with you.

COLONEL CHESROW: Mr. Stein, I would like to commend the Commandant and the entire Navy personnel for the fine cooperation and expedient manner in which they handled the problems which were presented to them.

MR. STEIN: Thank you. That is very good news indeed.

Yes, Mr. Poston?

MR. POSTON: This concludes the Department of Health, Education and Welfare's presentation and also that of the other Federal agencies. However, I would like to say that Colonel Mattina has indicated to me that he would be available.

Commander Charles E. Waite

He did not have a statement to make, but if there were questions pertaining to operation of the waterways in this area he would be available to give such answers as he may be able to assist in.

MR. STEIN: Colonel Mattina is with the Corps of Engineers?

MR. POSTON: Right.

MR. STEIN: At this point let's take a ten-minute recess and we will then resume with Indiana's presentation.

(Whereupon, a recess was taken.)

MR. STEIN: May we reconvene?

We have a couple of announcements. One, we will have more copies of the criteria available after lunch, and also you can place your name on a list at the front desk and they will be mailed to you if our supply runs out again.

Also, as you know, we have the President of the Sanitary District here, Colonel Chesrow, and in the audience is another distinguished member of the Sanitary District who has been a constant fighter for clean water in the lower end of the lake and has always kept his eyes on our program and prodded us to bigger and better things. Vice President Vincent Garrity, we thank you for coming.

May we continue now with the Indiana presentation?

Mr. Poole.

B. A. Poole

STATEMENT OF

BLUCHER A. POOLE, CONFEREES

MR. POOLE: Mr. Chairman, fellow conferees:

Since the March conference, the State of Indiana has been right diligent I believe in attempting to carry out the assignments that were given to it by the findings of the conferees at the conclusion of the March conference.

In a nutshell, this involved the treatment of sewage including chlorination, the establishment of a monitoring and surveillance program particularly within the industries, the establishment of a housekeeping program and a better operational program both within industries and in the sewage treatment plants, and the development of schedules for future construction.

I believe our report which will follow will indicate that except in the last category we have made real progress, particularly if you consider the complexity of the problem and the time involved.

The Indiana presentation will consist of first a statement on behalf of the Indiana Stream Pollution Control Board, which I anticipate will take us up to noon today or adjournment time -- it will be past noon -- and then we have asked the Mayors or representatives of the cities of Gary, East Chicago and Hammond to present brief reports on behalf

B. A. Poole

of their cities.

This will be followed by nine industries which are the industries, in our judgment at least, in Indiana that are involved with a major problem.

This is the agenda that I had brought with me. I have had one request for a brief statement on the part of a small community on the Little Calumet River, and since it will only take a few minutes I am going to try to work that statement in sometime during this afternoon's agenda.

I give you that because people have been asking me when they would appear and how long would the Indiana part of the program last and that sort of thing. I have seen only two or three of the statements from the 12 participants that will follow us, but I would guess, Mr. Chairman, that Indiana will consume the rest of the day and possibly might spill over to a little while in the morning.

MR. STEIN: That will be perfectly agreeable. We will stay here as long as reasonably feasible. There are two things that in my experience happen though when you stay too long. One, the reporter gives out. After all, this is one area where we still have to depend on human power. Secondly, the conferees tend to get a little testy. Sometimes this prolongs things and complicates things rather than facilitating them.

B. A. Poole

So we will try to do as well as we can. We all get testy except Klassen.

MR. KLASSEN: I missed the word, Mr. Chairman. Did you say "pesty" or "testy"? (Laughter)

MR. STEIN: Mr. Poole.

MR. POOLE: I am now going to introduce Perry Miller, assistant director of the Division of Sanitary Engineering of the Indiana State Board of Health, who will present the report on behalf of the Indiana Stream Pollution Control Board.

He is the same man who talked to you down in McCormick Place in March of last year.

Perry Miller.

Perry E. Miller

STATEMENT OF

PERRY E. MILLER, ASSISTANT DIRECTOR,
DIVISION OF SANITARY ENGINEERING,
INDIANA STATE BOARD OF HEALTH, ON
BEHALF OF INDIANA STREAM POLLUTION
CONTROL BOARD

MR. MILLER: Mr. Poole, Mr. Chairman, conferees,
ladies and gentlemen:

My name is Perry Miller, and I am representing the
Indiana Stream Pollution Control Board.

The Stream Pollution Control Board has made every
effort to carry out the recommendations made by the conferees
at the first session of the Conference on pollution of the
interstate waters of the Grand Calumet River, Little Calumet
River, Calumet River, Wolf Lake, Lake Michigan and their
tributaries (Indiana-Illinois).

A copy of the Conclusions and Recommendations of the
Conferees was mailed to every Indiana participant. The letter
transmitting the conclusions requested immediate action on
the recommendations of concern to the participant.

A preliminary surveillance program was initiated
to determine the characteristics of industrial wastes from
each plant. Three 24-hour composite samples from each outfall
sewer were analyzed for the following: pH, alkalinity, bio-

Perry E. Miller

chemical oxygen demand, chemical oxygen demand, dissolved oxygen, oil, suspended solids, ammonia-nitrogen, organic nitrogen, nitrate-nitrogen, iron, phosphates, sulfates, phenol cyanide, total coliform and fecal Streptococci, and flow was also measured.

INDUSTRIAL

All industrial plants requested to make the preliminary surveillance tests have completed them and submitted the analytical results to the Board.

The preliminary surveillance data, routine monitoring data and plant inspections indicate the following:

A. Adequate waste control facilities.

Vulcan Detinning Division, Vulcan Materials Company; U. S. S. Lead Refinery, Inc.; General American Transportation Corporation; American Steel Foundries; Union Carbide Corporation, Linde Division; American Bridge Division, U. S. Steel Corporation; Northern Indiana Public Service Company, Bailly Generating Station and Dean H. Mitchell Station; Universal Atlas Cement Company, U. S. Steel Corporation; Commonwealth Edison Company of Indiana, Inc.; Simmons Company; Adolph Plating, Inc.; LaSalle Steel Company; Midwest Steel Division, National Steel Corporation; and Bethlehem Steel Company.

B. Water quality criteria will probably establish

Perry E. Miller

additional treatment needs.

Cities Service Oil Company; E. I. du Pont de Nemours & Company; Mobil Oil Company; Sinclair Refining Company; Union Carbide Corporation, Chemicals Division; American Oil Company; and American Maize-Products Company.

C. Need control or treatment facilities.

Blaw-Knox Company; Calumet Nitrogen Products Company; Youngstown Sheet & Tube Company; National Tube Division, U. S. Steel Corporation; Gary Steel Works, U. S. Steel Corporation; Gary Sheet & Tin Mill Division, U. S. Steel Corporation; Inland Steel Company; M & T Chemicals, Inc.; and Lever Brothers Company.

D. Need control or treatment facilities and currently negotiating for connection to a sanitary district sewer system.

Union Tank Car Company and Georgia-Pacific Corporation (formerly Steiner Tissue Mill).

E. Evaluation needed of facilities installed since March, 1965.

U. S. Gypsum Company.

F. No longer operating production facilities.

Berry Refining Company.

Waste load data from routine monitoring programs for total plant loads were supplied by eight plants and

Perry E. Miller

partial load data by two plants prior to the March 1965 conference. Since the conference 11 additional plants have established monitoring programs. The waste load to the Grand Calumet River from four U. S. Steel Corporation plants is determined by sampling the river. Outfall sewer sampling is also included to determine waste loads and the effectiveness of control facilities. E. I. du Pont de Nemours & Company has ordered samplers to monitor all significant waste discharges. Youngstown Sheet & Tube Company submits data for only one outfall sewer and must expand its sampling program. The following plants must establish monitoring programs: Universal Atlas Cement Company, U. S. Steel Corporation, and M & T Chemicals, Inc. The data from the monitoring programs and the preliminary surveillance program are maintained in open files.

Substantial reductions have been made in BOD, oil, ammonia-nitrogen, phenol and sulfides when the present monitoring data are compared with the data in Table VI of the Department of Health, Education, and Welfare report of February, 1965 and also with previous plant monitoring data.

Part of these reductions are the result of improved operation of facilities and improved housekeeping. Part is from the completion of new facilities which were designed before the March conference. The next six to 12 months

Perry E. Miller

should bring further reductions as construction of treatment works now approved are completed. However, the treatment necessary to meet the water quality criteria when established will require meetings with the companies involved to determine waste effluent quality.

MUNICIPAL

Commendable progress has been made in the disinfection of treatment plant effluents. Gary placed chlorination facilities in operation December 1, 1965; construction bids have been received for chlorination at Hammond and East Gary. All sewage treatment plants will have disinfection when the Hammond and East Gary facilities are completed.

The City of Crown Point started construction of additions to its activated sludge-type sewage treatment plant and chlorination facilities. The City of Valparaiso started construction of additions to the effluent chlorination facilities.

The Sanitary District of East Chicago is treating wastes from General American Transportation Corporation, has been treating ammonia still liquor from Inland Steel Company, and for a short time accepted ammonia still wastes from Youngstown Sheet & Tube Company. The District has proposed the construction of a deep lagoon to receive a portion of the storm water and the treatment plant effluent.

Perry E. Miller

This combined waste would receive tertiary treatment including chlorination and be available for industrial water supply.

The Town of Porter is the only community that has not provided treatment of sewage. The town is under order of the Board to provide adequate facilities. A consulting engineering firm has been authorized to design sewage treatment facilities.

Increased surveillance of semi-public installations has brought about improvements in the facilities and operation thereof. Progress is being made towards obtaining connections to municipal sewer systems and the provision of effluent chlorination for the remainder of the semi-public plants.

The beach sampling conducted by Department of Health, Education, and Welfare, Chicago Park Department, and the Indiana Stream Pollution Control Board show 13 or 38 samples from the Whiting beach had a coliform density of less than 1,000 per 100 ml. The Department of Health, Education, and Welfare report of February, 1965 states coliform densities usually exceed 1,000 per 100 ml. The beaches sampled by the Board in the Burns Ditch area were consistently low and satisfactory for swimming.

There follows a brief discussion by river systems

Perry E. Miller

of the progress by each municipality and each industrial plant in the area covered by the conference. The same order has been followed as in the Indiana Stream Pollution Control Board Report of February, 1965.

GRAND CALUMET - INDIANA HARBOR CANAL - LAKE MICHIGAN

East Chicago - The East Chicago Sanitary District is working with industry and initiating a program of accepting industrial waste that can be treated at the sewage treatment plant. Industrial wastes from U. S. S. Lead Refinery, Inc., General American Transportation Corporation, paint booth wastes from Blaw-Knox Company, and ammonia still wastes from Inland Steel Company are now discharged to interceptor sewers for treatment at the District plant. Youngstown Sheet & Tube Company proposes the connection of ammonia still wastes to District sewers for treatment. Effluent chlorination is provided.

The treatment facilities are designed for 20 mgd with utilization of chemical treatment to supplement the activated sludge process. The plant is now treating 12 to 14 mgd, and the effluent BOD and suspended solids average 12 mg/liter. The average quantity of phenol in the plant effluent is reported as five parts per billion. However, surface settling rates and detention times in the tanks will be less than recommended standards at flows of approximately

Perry E. Miller

15 mgd; therefore, close control will be required to maintain satisfactory treatment at higher loadings.

The District has proposed the construction of a deep lagoon to receive storm water from approximately one-third of the city and the sewage treatment plant effluent. This combined waste would receive tertiary treatment including chlorination prior to delivery to industry and/or discharge to the receiving stream.

Gary - The Sanitary District completed construction of sewage treatment plant additions during the summer of 1965 and placed effluent chlorination facilities in operation on December 1, 1965. The Gary Steel Works proposes the discharge of coke plant wastes and the remaining sanitary sewage, the Gary Sheet and Tin Mill proposes the discharge of the remaining sanitary sewage and the Georgia-Pacific Corporation proposes the discharge of industrial waste to interceptor sewers for treatment at the District plant. The Merrillville Conservancy District will discharge sewage and wastes to Gary early in 1966 for treatment at the District plant.

The District facilities are designed to provide secondary treatment for 60 mgd and primary treatment for an additional 20 mgd. The plant is now treating 30 to 35 mgd and the effluent BOD and suspended solids average about

Perry E. Miller

12 mg/liter. Adequate capacity is available for the proposed additional sewage and waste discharges.

Merrillville Conservancy District - Construction of sanitary sewers in the District area south of Gary is approximately 65 per cent complete. The lift station and force main connection to the Gary Sanitary District should be completed by January, 1966. In addition to providing sewer service for over 1,500 homes within District boundaries, service will be provided for several adjacent communities and semi-public establishments. The subdivisions to be connected include Turkey Creek Meadows and Chapel Manor with an estimated 1,000 homes.

Vulcan Detinning Division, Vulcan Materials Company, Gary - The company is selling spent caustic that was formerly discharged to the Grand Calumet River. Bacteriological samples indicated no evidence of sewage contamination. Uncontaminated cooling water is discharged to the Grand Calumet River. Periodic inspections will be made to insure that adequate waste control is maintained.

Cities Service Oil Company, East Chicago - The preliminary surveillance program has been completed and a routine sampling program has been established. The results of the monitoring program, when compared with Table VI-5b of the Department of Health, Education, and Welfare report of

Perry E. Miller

February, 1965 show the following reductions: BOD 73 per cent; oil 92 per cent; ammonia-nitrogen 81 per cent; and phenol 72 per cent. The bacteriological samples show no evidence of sewage contamination. The establishment of water quality criteria for the area may require further reduction of contaminants.

E. I. du Pont de Nemours & Company, Inc., East Chicago -

The results of the preliminary surveillance program revealed that concentrations of suspended solids and acidity are significant. The bacteriological samples show no evidence of sewage contamination. A routine sampling program is being established. Since March, 1965 the company has installed a sulfur-dioxide recovery system and it reports 98 per cent recovery of the sulfur-dioxide in the wastes discharged to the Grand Calumet River. The following waste control projects are proposed: Discontinue zinc ore roasting operation (1967), new treatment facilities for filter aid wastes and revisions to the acid neutralization facilities. The establishment of water quality criteria may require further reduction of contaminants.

U. S. S. Lead Refinery, Inc., East Chicago - The preliminary surveillance program was not required. Inspection by representatives of the Board indicates that all wastes are discharged to the East Chicago Sanitary District sewerage

Perry E. Miller

system. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

General American Transportation Corporation, East Chicago -

A preliminary surveillance program was not required. The company has connected all industrial waste to the East Chicago Sanitary District. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

Blaw-Knox Company, East Chicago - The preliminary surveillance program has been completed. Inspections by representatives of the Board indicate that concentrations of suspended solids and oils are significant. The bacteriological samples showed evidence of sewage contamination. The company has completed the following waste control projects since March, 1965: Recirculation of wash water from the sand reclamation operation, connection of paint booth waste to the East Chicago Sanitary District sewerage system and conversion to dry dust collectors at two locations. The workers at the main plant were on strike from October 6 to November 14, 1965, and data on the wastes discharged are not available at this time to determine the effectiveness of the above facilities. Dye tests are being conducted to determine the sources of sewage in the discharge to the Indiana Harbor Canal. The company

Perry E. Miller

must provide additional waste control facilities to reduce suspended solids and oil.

American Steel Foundries, East Chicago - The preliminary surveillance program indicates that the company waste disposal is adequate. The bacteriological samples showed evidence of sewage contamination; however, the company recently located and repaired a broken section of the sanitary sewer and all sewage is discharged to the East Chicago Sanitary District for treatment. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

Union Carbide Corporation, Linde Division, East Chicago - The results of the preliminary surveillance program indicates that the corporation's waste disposal is adequate. The bacteriological samples show no evidence of sewage contamination. The corporation has completed the following waste control projects since March, 1965: Disconnected roof drains and cooling water from the settling basin, connected oily waste to the settling basin, installed an automatic controller on the cooling towers and installed oil separation baffles on the settling basin. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

Mobil Oil Company, East Chicago - The preliminary surveillance

Perry E. Miller

program has been completed and a routine sampling program established. The routine sampling program indicates periodically high concentrations of BOD, suspended solids, oil, phenol and ammonia. Two out of five outfalls convey significant wastes. Bacteriological samples indicate no sewage contamination. Since March, 1965 the company has completed the following: Sludge pits, facilities for collecting spent caustic, piping changes in the alkylation unit to prevent sulfuric acid spills and installed automatic samplers, pH recorder, temperature recorder, and flow measuring equipment.

The results of the monitoring program, when compared with Table VI-5c of the Department of Health, Education, and Welfare report of February, 1965 show the following reductions: ammonia-nitrogen 90 per cent, phenol 90 per cent, and BOD 21 per cent, and when compared with company data a reduction of sulfides of 90 per cent and oil of 53 per cent.

The following is proposed: Caustic drip and drain collection system, and divert wash water from the alkylation unit to the sludge pit. Additional in-plant control and improved housekeeping practices are needed to eliminate periodically high BOD, suspended solids, oil, phenol and ammonia in the main outfall. The establishment of water quality criteria for the area may require further reduction of contaminants.

Perry E. Miller

Calumet Nitrogen Products Company, Hammond - The preliminary surveillance program has been completed and a routine sampling program established. The results of the routine sampling program indicate that concentrations of ammonia and nitrite-nitrogen in the company's effluent is significant. The bacteriological samples showed no evidence of sewage contamination. Since the March, 1965 conference the company has discontinued the use of lime softening of boiler feed water in order to reduce concentrations of suspended solids in the effluent. Future plans for waste control include the discharge of spent caustic into the Hammond Sanitary District sewerage system.

The results of the monitoring program, when compared with Table VI-5c of the Department of Health, Education, and Welfare report of February, 1965 show the following reductions: Ammonia-nitrogen 74 per cent; and total nitrogen 74 per cent. Additional reduction of ammonia and nitrate-nitrogen are needed to provide a satisfactory effluent.

Union Tank Car Company, Whiting - The results of the preliminary surveillance program revealed that concentrations of BOD, suspended solids and oil are significant. The bacteriological samples showed evidence of sewage contamination. The company proposes the following waste control projects: Diversion of in-plant storm drains from the oil

separator, recirculation of water from the hydrostatic testing operations, and is negotiating a connection to the Hammond Sanitary District sewerage system. Diversion of storm water from the oil separator and connection to the Hammond Sanitary District sewerage system would provide satisfactory waste disposal for the company.

Sinclair Refining Company, East Chicago - The preliminary surveillance program has been completed and a routine sampling program established. The routine sampling program indicates periodically high concentrations of BOD, suspended solids, oil, phenol and ammonia. The bacteriological samples show no evidence of sewage contamination. Since March, 1965 the company has completed the following: Sludge-holding tanks, oil separation boom on the Indiana Harbor Ship Canal, and installed an automatic sampler. Additional in-plant controls and improved housekeeping practices are needed to eliminate periodically high BOD, suspended solids, oil, phenol and ammonia in the main outfall. The establishment of water quality criteria for the area may require further reduction of contaminants.

U. S. Gypsum Company, East Chicago - The results of the preliminary surveillance program revealed high concentrations of suspended solids. Bacteriological results show no evidence of sewage contamination. A routine effluent sampling program has been established. The company completed construction of a

Perry E. Miller

settling basin in November, 1965. Evaluation of new facilities will determine if additional treatment is required.

Youngstown Sheet and Tube Company, East Chicago - The results of the preliminary surveillance program revealed that concentrations of BOD, suspended solids, oils, ammonia-nitrogen and phenols are significant. The bacteriological samples from eight outfalls showed high coliform densities. However, subsequent tests by the company and dye tests have shown that all sewage is discharged to the East Chicago Sanitary District for treatment.

The company proposes the following waste control projects: Connection to the East Chicago Sanitary District for disposal of remaining sewage, connection to the East Chicago Sanitary District for ammonia still wastes, naphthalene recovery system, return caustic to the flue gas washer water, waste pickle liquor holding tanks, waste pickle liquor disposal on hot slag, seamless mill oil recovery facilities, terminal settling lagoon with recirculation of clarified effluent to the plant process water supply. This program is to be completed within 30 months. Adequate waste treatment facilities must be installed.

National Tube Division, U. S. Steel Corporation, Gary -

The preliminary surveillance program revealed that concentrations of oil, acidity and suspended solids from both outfalls

Perry E. Miller

are significant. The bacteriological samples showed no evidence of sewage contamination. The corporation has employed a consulting engineering firm to study the industrial waste problem at the National Tube Division. The engineering studies are to be completed by December, 1966. Adequate waste treatment facilities must be installed.

Gary Steel Works, U. S. Steel Corporation, Gary - The results of the preliminary surveillance program revealed that concentrations of BOD, oils, suspended solids, ammonia-nitrogen and phenol are significant. Four of 13 outfalls do not convey significant wastes. The bacteriological samples show that five of 13 outfalls have sewage contamination. The corporation proposes the following waste control projects: Continuous casting line waste treatment facilities to be completed by July 1, 1966, oil skimmer on the Grand Calumet River (these plans approved by the Stream Pollution Control Board on December 2, 1965), connection to the Gary Sanitary District sewerage system for disposal of coke plant wastes and remaining sanitary wastes. The corporation has employed a consulting engineering firm to study the industrial waste problem at the Gary Steel Works. The engineering studies are to be completed by December, 1966. A partial sampling program has been established. Adequate treatment facilities must be provided.

Perry E. Miller

Gary Sheet and Tin Mill, U. S. Steel Corporation, Gary -

The results of the preliminary surveillance program revealed that concentrations of BOD, oils, suspended solids and acidity are significant. The bacteriological samples indicate that two of three outfalls show evidence of sewage contamination. The Stream Pollution Control Board approved plans for treatment facilities at a new 84-inch hot strip mill for reduction of scale, suspended solids and oil and for treatment facilities at a new six-stand tandem cold reduction mill and existing west five-stand cold reduction tin mill, four-stand sheet mill, three-stand sheet mill and three other cold reduction mills for reduction of oils and suspended solids. The remaining sewage will be discharged to the Gary Sanitary District for treatment. A deep well for disposal of waste sulfuric acid will be completed in March, 1966. Completion of these waste disposal and treatment works will provide treatment for a majority of the wastes at this mill. Engineering studies are in progress to determine additional treatment needs.

American Bridge Division, U. S. Steel Corporation, Gary -

The results of the preliminary surveillance program revealed that the wastes are not significant. The bacteriological samples show no evidence of sewage contamination. Periodic inspections will be made by representatives of the Board to

Perry E. Miller

insure that adequate waste control is maintained.

Georgia-Pacific Corporation, (Steiner Tissue Mill), Gary -

The results of the preliminary surveillance program revealed that concentrations of BOD, suspended solids and oils in the corporation's effluent are significant. The preliminary surveillance data, when compared with Table VI-5b of the Department of Health, Education, and Welfare report of February, 1965 show a 63 per cent reduction of BOD. The bacteriological samples showed no evidence of sewage contamination. A routine effluent sampling program was not established. The corporation is currently negotiating with the Gary Sanitary District for connection to the Gary sewerage system for disposal of the industrial waste. Connection to the Gary system with adequate pretreatment would provide satisfactory disposal of the corporation's waste.

Berry Refining Company, Gary - This company was included in the original list of industries designated to participate in the conference. On May 1, 1965 the company closed the refinery at Gary.

Northern Indiana Public Service Company, Bailly Station,

Baileytown - A preliminary surveillance program was not required. Bacteriological samples indicate no sewage contamination. Inspections by representatives of the Board indicate that waste disposal is adequate. Periodic inspections

Perry E. Miller

will be made by a representative of the Board to insure that adequate waste control is maintained.

Inland Steel Company, East Chicago - The results of the preliminary surveillance program indicate that concentrations of BOD, oils, suspended solids, acidity, ammonia, and phenol are significant. Seven of 19 outfalls do not convey significant wastes. The bacteriological samples indicate that four outfalls show evidence of sewage contamination. The company has established a routine effluent sampling program. The following waste control projects have been completed since March, 1965: Connection of ammonia still wastes to the East Chicago Sanitary District, recirculation of final coke plant cooling waters, and installed two automatic samplers. The company reports it has substantially reduced phenols and ammonia-nitrogen and increased fee oil recovery 200,000 gallons per year.

The following waste control projects are planned: Use of 80-inch hot strip mill waste treatment facilities for disposal of waste pickle liquor, engineering studies to determine practicability of using a deep well disposal system for waste pickle liquor, expansion and modernization of the North End lagoon, seven additional automatic samplers, No. 4 Basic Oxygen Furnace recirculation system, expansion of the No. 2 sewage treatment plant, and connection of the remaining

Perry E. Miller

sanitary wastes to the sewage treatment plants. Adequate treatment facilities must be provided.

Universal Atlas Cement Division, U.S. Steel Corporation, Gary -

The results of the preliminary sampling program and inspection by representatives of the Board indicate waste disposal is adequate. The bacteriological samples showed evidence of sewage contamination. The company has completed the following waste control projects since March, 1965: Effluent chlorination facilities and oil separation. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

Northern Indiana Public Service Company, Mitchell Station,

Gary - A preliminary surveillance program was not required.

Bacteriological samples indicated no sewage contamination. The company completed construction of a sand filter and total ground absorption system for disposal of sanitary wastes in October, 1965. Inspections by the State indicate that waste disposal is adequate. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

Union Carbide Corporation, Chemicals Division, Whiting -

The preliminary surveillance program has been completed and a routine sampling program established. The routine sampling program indicates periodically high concentrations of BOD

Perry E. Miller

and suspended solids in the corporation's two outfalls. However, the monthly operation reports for September and October show improved waste control. These reports, when compared with Table VI-5a of the Department of Health, Education, and Welfare report of February, 1965 show the following reductions: BOD 36 per cent, and from company data a suspended solids reduction of 82 per cent. The bacteriological samples show no evidence of sewage contamination. The corporation has completed the following waste control projects since March, 1965: Polyethylene pellet recovery facilities, oil collection sumps, waste oil storage tanks, oil emulsion decanter tanks and a settling basin. Establishment of water quality criteria for the area may require further reduction of contaminants.

American Oil Company, Whiting - The results of the preliminary surveillance program revealed that concentrations of BOD and ammonia-nitrogen in the effluent are significant. The bacteriological samples show no sewage contamination. The routine effluent sampling program indicates that periodically high concentrations of oil and phenol are also significant. The company has completed the following waste control projects since March, 1965: Replaced the acid and clay treating facilities at the Propane Dewaxing Plant with a new hydro-finishing unit, increased the oxygen input to the bio-flotation process by increasing the submergence of the aeration brushes, installed four mechanical aerators in

Perry E. Miller

the bio-flotation basin, and provided segregation, collection and separate disposal of wastes from the heavy oils area of the refinery. Additional in-plant controls and improved housekeeping practices are needed to eliminate periodically high concentrations of oil and phenol in the effluent. The establishment of water quality criteria for the area may necessitate further removal of contaminants.

American Maize-Products Company, Hammond - The preliminary surveillance program has been completed and the routine sampling program expanded. The routine sampling program indicates periodically high concentrations of BOD. The bacteriological samples show no evidence of sewage contamination. The company has completed the following waste control facilities since March, 1965: Primary settling basins for starch filtrate, enlargement of aerobic lagoon, diversion of condenser waters to the lagoon system, and a surface condenser on a steepwater evaporator. The monitoring data, when compared with Table VI-5a of the Department of Health, Education, and Welfare report of February, 1965 show a 34 per cent reduction in BOD. The company proposes installation of additional mechanical aeration to the aerobic lagoon. Development of water quality criteria for the area may necessitate further removal of contaminants.

Commonwealth Edison Company of Indiana, Hammond - The prelim-

Perry E. Miller

inary surveillance program was not required. Bacteriological samples indicated no evidence of sewage contamination. Inspections by representatives of the Board indicate that waste disposal is adequate. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

LITTLE CALUMET RIVER - BURNS DITCH

Crown Point - The city has started construction of additions to its activated sludge-type sewage treatment plant to increase the design flow from 0.8 to 1.8 mgd. Effluent chlorination facilities will also be enlarged. Extension of the sewer system will provide sewer service to areas that are not now served. It is estimated the project will be completed by July 1, 1966.

Effluent chlorination was provided this past season and is continuing.

Hobart - The city is providing secondary treatment. Effluent chlorination provided May through October.

East Gary - Sewage from East Gary is treated at the Gary (Miller) District sewage treatment plant. Effluent chlorination was not provided; however, plans have been approved and construction bids received for plant improvements including effluent chlorination. The city is considering the construction of a new sewage treatment plant in the near future.

Perry E. Miller

Chesterton - The town is providing secondary treatment and effluent chlorination.

Valparaiso - The city is providing secondary treatment and effluent chlorination. Additions to effluent chlorination facilities are under construction. A preliminary engineering report on sewage plant additions has been received.

Porter - The town has advised that no agreement had been reached for sewage treatment by contract with the town of Chesterton. A consulting engineering firm has been authorized to design sewage treatment facilities.

No action is reported on New Chicago and Portage; these municipalities are not served by sewer systems.

Semi-Public - Seven of the semi-public installations in this basin plan to connect to the Merrillville Conservancy District sewer system. With the exception of four relatively small installations which are served by septic tanks and sand filters or absorption fields, the rest provide secondary treatment facilities; 17 of these now have effluent chlorination facilities and the other five have chlorination facilities approved and/or promised by April 11, 1966.

In general, the operation and maintenance of the semi-public treatment facilities has improved.

Perry E. Miller

LITTLE CALUMET RIVER - WEST

Dyer - The activated sludge-type sewage treatment plant including effluent chlorination and north interceptor sewer should be ready for operation by December 31, 1965. Other interceptor sewer work should be completed by June 1, 1966.

Highland - Construction of the lift stations and sewer connection to the Hammond Sanitary District interceptor is continuing. The project should be completed by June 1, 1966.

Schererville - The secondary sewage treatment facilities, including effluent chlorination, were placed in operation about June 1, 1965.

Griffith and Munster - The sewage from these municipalities is discharged to the Hammond Sanitary District for treatment. Problems have been encountered with overloading of the south interceptor of the Hammond Sanitary District resulting in the occasional discharge of sewage and wastes to the Little Calumet River from Highland and Griffith. Plans for a relief interceptor have been approved and construction bids were received in December, 1965. The sewer construction can be completed in 1966.

The overflow from combined sewers and the discharge from storm water pumping stations, particularly during low stream flow periods, will continue to cause localized undesirable conditions in the Little Calumet River. The United

Perry E. Miller

States Geological Survey stream flow records show flows as low as 4 mgd in the river near the Indiana-Illinois State line.

Simmons Company, Munster - The results of the preliminary surveillance program indicate that waste disposal is adequate. The company proposes the installation of automatic control equipment and conversion to continuous chromium treatment in order to provide optimum waste control. A routine effluent sampling program has been established. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

GRAND CALUMET RIVER - WEST

Hammond - Plans for effluent chlorination facilities for the Hammond Sanitary District sewage treatment plant have been approved and construction bids were received in December, 1963. Construction should be completed in 1966. The Calumet Nitrogen Products Company proposes the discharge of spent caustic to the District and the Union Tank Car Company and LaSalle Steel Company propose connections to the interceptor sewers for treatment of wastes at the District plant.

The treatment facilities are designed for a flow of 36 mgd. The plant is now treating 32 to 34 mgd. Problems were encountered with replacement of air diffusion equipment in existing aeration tanks and from time to time inadequately

Perry E. Miller

treated sewage and wastes were discharged to the Grant Calumet River. The effluent BOD and suspended solids average about 20 mg/liter. The District plant can handle the waste from the proposed industry connections; however, additional sewage treatment facilities will be required in the near future.

The District has made some progress with sewer separation by the construction of sanitary relief sewers. However, as interconnections are provided with existing combined sewers, storm water overflows still discharge sewage and wastes to receiving streams with surface water runoff. Additional sewer separation is needed.

Whiting - A consulting engineering firm has presented a preliminary plan to the city for separation of sewers in the drainage area which outfalls to Lake Michigan at Front Street. The city is now investigating the feasibility of financing this project.

The operation of the Front Street lift station has improved materially. From June through October sewage was discharged to the lake on only 13 occasions for a total of 106 hours. Twenty-nine hours of bypassing was caused by a sump pump failure which flooded out the pump motors and two and one-half hours by a power outage beyond the city control.

Perry E. Miller

Adolph Plating Inc., Electro galvanizing Division, East

Chicago - The preliminary surveillance program was not required. The bacteriological samples indicated no sewage contamination. Inspections by representatives of the Board indicate that waste disposal is adequate. A routine sampling program is being established. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

LaSalle Steel Company, Hammond - The results of the preliminary surveillance program and a routine effluent sampling program indicate that waste disposal is adequate. The bacteriological samples showed no sewage contamination. The company is negotiating with the Hammond Sanitary District for connection to the Hammond sewerage system. Periodic inspections will be made by representatives of the Board to insure that adequate waste control is maintained.

M & T Chemicals, Inc., East Chicago - The company was not included in the original invitations for industries to participate in the conference. Subsequent investigations and results of the preliminary surveillance program revealed that the concentrations of BOD, suspended solids and oils are significant. The bacteriological samples showed evidence of sewage contamination. The company has not developed a satisfactory waste control program.

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WOLF LAKE

Lever Brothers Company, Hammond - The preliminary surveillance program has been completed and a routine sampling program established. The routine sampling program indicates variations in BOD and suspended solids in the effluent. There is no interstate pollution of Wolf Lake from this source. Additional in-plant control and housekeeping practices are needed to reduce the variations in waste discharges to the Indiana waters of Wolf Lake.

SUMMARY

1. All municipalities, except Porter, are providing secondary treatment and all will provide effluent chlorination when the Hammond and East Gary facilities are completed in 1966.
2. The Sanitary Districts of Gary, Hammond and East Chicago are cooperating with industrial plants to treat industrial wastes.
3. The East Chicago Sanitary District has proposed construction of a lagoon to receive storm water from approximately one-third of the city and the effluent of the sewage treatment plant. The combined wastes would receive tertiary treatment including effluent chlorination and be available for industrial water supply.

Perry E. Miller

4. Beach sampling showed the beaches in the Burns Ditch area were consistently satisfactory for swimming. The Whiting Beach samples based on coliform density show improvement when compared with those in the report of Department of Health, Education, and Welfare of February, 1965.

5. All industrial plants requested to make preliminary surveillance tests did so and submitted the analytical results to the Board. Total or partial monitoring programs have been established except at two industrial plants. Data from both programs are maintained in open files.

6. Substantial reductions have been made in BOD, oil, ammonia-nitrogen, phenols and sulfides by improved house-keeping and installation of new facilities.

7. Fifteen industrial plants have adequate waste control facilities, two are negotiating to connect to sanitary district sewer systems, one plant completed facilities in November and these facilities must be evaluated, and one plant is no longer operating. Nine plants must provide additional treatment. Of these one is Lever Brothers which is involved in Indiana waters and not interstate waters. Seven plants will probably need additional treatment when water quality criteria are adopted.

8. A number of semi-public installations will be eliminated and connection made to municipal sewers. Seventeen semi-

Perry E. Miller

public plants provide secondary treatment including chlorination and five others with secondary treatment have chlorination facilities approved and/or promised by April 11, 1966.

Thank you.

MR. STEIN: Thank you, Mr. Miller, for a very comprehensive and excellent report.

Are there any comments or questions?

MR. KLASSEN: Mr. Miller, will the Gary people be here? Or should I ask you the questions that I would have asked them?

MR. MILLER: Mr. Klassen, the Gary people will be here. They are expected to make a report this afternoon.

MR. KLASSEN: Okay. I will save that.

Also, just on page one, different States have different interpretations of words. When you say "waste control facilities" in "A," is that measuring devices and this type of thing?

MR. MILLER: No, in "A" we mean the treatment that they have installed that we consider as satisfactory and as being adequate for the area.

MR. KLASSEN: Okay.

MR. MILLER: Some of them do, however, have measuring devices as well.

MR. STEIN: Thank you.

Perry E. Miller

Are there any further questions or comments?

(No response.)

If not, thank you very much, Mr. Miller.

I think you can appreciate the magnitude of the problem faced by Indiana in attempting to bring this problem under control and the painstaking way you have to go through to achieve that control. I think the progress indicated here is admirable.

Again, let me say, as indicated, this is a technical meeting and there is no other way to pollution control that I know of but getting down to naming places and dealing with the materials where they come out and dealing with the hard technical problems presented.

I think Indiana is well on its way.

At the present time we will recess for lunch and reconvene promptly at two o'clock. Thank you.

(Whereupon, at 12:40 p.m., the luncheon recess was taken.)